

HORTICULTURAL ABSTRACTS

Vol. XXX

September 1960

No. 3

Initialled reviews not by Bureau staff are by P. Becker and D. E. Green of the Royal Horticultural Society's Gardens, Wisley, G. F. Sheard of the Glasshouse Crops Research Institute, Littlehampton, and G. St.C. Feilden.

INDEX OF CONTENTS.

	Nos.		Nos.
MISCELLANEOUS		Vines—growth, reproduction and physiology	3494-3509
Abstr. 98. Noted 46	3084-3227	Vines—grape composition	3510-3512
General	3084-3094	Temperate nuts	3513-3522
Climate and air pollution	3095-3099		
Pollen and bees	3100-3103	PLANT PROTECTION OF TEMPERATE FRUITS	
Seeds	3104-3106	Abstr. 80. Noted 24	3523-3626
Vegetative propagation	3107	General	3523-3525
Irrigation	3108-3110	Viruses	3526-3545
Composts and mulches	3111-3115	Bacteria	3546-3547
Nutrition	3116-3126	Fungi	3548-3566
Plant composition	3127-3134	Nematodes	3567-3569
Tissue culture	3135-3137	Mites	3570-3581
Physiology and metabolism	3138-3149	Insect pests	3582-3608
Growth substances	3150-3175	Chemicals and their application	3609-3626
Experimental and statistical techniques	3176-3187		
Practical and research equipment	3188-3205	WEEDS AND WEED CONTROL	
Greenhouses and frames	3206-3219	Abstr. 56. Noted 19	3627-3701
Packing, storage and marketing	3220-3227	General	3627-3637
		Specific weeds	3638-3642
TEMPERATE TREE FRUITS		Weed control in temperate fruit crops	3643-3653
Abstr. 127. Noted 45	3228-3399	Weed control in ornamentals and turf	3654-3665
General	3228-3235	Weed control in tropical and sub-tropical crops	3666-3676
Breeding and varieties	3236-3252	Weed control in vegetables	3677-3700
Propagation and rootstocks	3253-3271	Weed control in hemp	3701
Climatic factors and air pollution	3272-3285		
Soil management and irrigation	3286-3292	VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE	
Nutrition and tree composition	3293-3315	Abstr. 192. Noted 58	3702-3951
Growth and physiology	3316-3333	General	3702-3728
Training, pruning and grubbing	3334-3342	Artichokes	3729-3730
Pollination and fruit development	3343-3351	Asparagus	3731-3733
Spraying to regulate cropping	3352-3364	Brassicas	3734-3765
Fruit composition	3365-3370	Celery	3766-3774
Harvesting, packing and marketing	3371-3378	Cucurbits	3775-3797
Storage	3379-3399	Legumes—beans	3798-3819
		Legumes—peas	3820-3840
SMALL FRUITS, VINES AND NUTS		Lettuce and other salad crops	3841-3850
Abstr. 80. Noted 43	3400-3522	Mushrooms	3851-3856
Strawberries	3400-3424	Okra	3857-3858
Other small fruits	3425-3448	Onions	3859-3872
Vines—general	3449-3451	Root crops	3873-3888
Vines—breeding and varieties	3452-3456	Spinach	3889-3892
Vines—propagation and rootstocks	3457-3469	Sweet and red peppers and eggplants	3893-3899
Vines—climatic factors	3470-3475		
Vines—soil management and nutrition	3476-3490		
Vines—training and pruning	3491-3493		

Nos.

Tomatoes—general	3900-3902
Tomatoes—breeding and varieties ..	3903-3910
Tomatoes—environment and nutrition	3911-3919
Tomatoes—growth and physiology ..	3920-3930
Tomatoes—diseases and pests ..	3931-3949
Tomatoes—fruit composition and cooling	3950-3951

TOBACCO

Abstr. 48. Noted 26 3952-4025

General	3952-3958
Breeding and varieties	3959-3965
Seeds and seed-beds	3966-3975
Cultural practices	3976-3979
Nutrition	3980-3986
Physiology, biochemistry and crop composition	3987-4001
Disorders, diseases and pests ..	4002-4017
Curing, grading and storage ..	4018-4025

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS

Abstr. 69. Noted 47 4026-4141

Condiment and spice plants ..	4026-4035
Drug plants	4036-4060
Essential oils	4061-4071
Fibres	4072-4082
Hops	4083-4117
Insecticidal plants	4118-4119
Plant sources of antibiotics	4120-4125
Rubber plants	4126-4127
Seed oils	4128-4135
Tannin plants	4136-4138
Sundry plants	4139-4141

FLORICULTURE

Abstr. 114. Noted 30 4142-4285

General	4142-4145
Annual and herbaceous plants ..	4146-4179
Bulbs, tubers, etc.	4180-4223
Lawns and sports turf	4224-4228
Foliage and succulent plants ..	4229-4235
Orchids	4236-4238
Roses	4239-4247
Other trees and shrubs	4248-4285

SUB-TROPICAL FRUIT AND PLANTATION CROPS

Abstr. 72. Noted 18 4286-4375

General	4286-4287
Avocados	4288-4292
Carobs	4293
Citrus—breeding, varieties and propagation	4294-4299

Nos.

Citrus—climate, irrigation and nutrition	4300-4314
Citrus—growth and physiology ..	4315-4319
Citrus—pollination, fruit development and composition	4320-4322
Citrus—diseases and pests	4329-4347
Citrus—fruit handling, storage and by-products	4348-4356
Dates	4357-4358
Litchis	4360-4365
Olives	4362-4365
Passion fruit	—
Persimmons	4366-4368
Pomegranates	4368
Tung	4369-4377

TROPICAL FRUIT AND PLANTATION CROPS

Abstr. 158. Noted 62 4376-4599

General	4376-4383
Areca palms	4382-4384
Bananas and abaca	4385-4399
Cacao	4400-4422
Coconuts	4423-4432
Coffee—general	4433-4434
Coffee—propagation, establishment and culture	4435-4449
Coffee—diseases and pests	4450-4458
Coffee—processing and composition	4459-4466
Mangoes	4462-4463
Oil palms	4466-4468
Papaws	4469-4471
Pineapples	4472-4476
Rubber trees	4477-4497
Sugar cane—general	4498-4502
Sugar cane—breeding and varieties	4503-4512
Sugar cane—planting and culture ..	4514-4523
Sugar cane—nutrition	4524-4533
Sugar cane—disorders, diseases and pests	4534-4547
Sugar cane—harvesting and by-products	4548-4550
Tea—general	4551-4557
Tea—propagation, environment and growth	4558-4566
Tea—nutrition	4567-4574
Tea—diseases and pests	4575-4584
Tea—processing and composition ..	4585-4586
Sundry crops	4587-4599

NOTES ON BOOKS AND REPORTS

Abstr. 34. Noted 9 4596-4638

Books	4596-4603
Annuals and reports	4604-4637
New periodical	4638

Total Abstracts 1128. Noted 427.

EDITORIAL NOTES

TRANSLATIONS AVAILABLE

Details of the small-scale, experimental translation service operated by this Bureau were given a year ago in the Editorial Notes in *H.A.*, Vol. 29, No. 3, and were repeated in an advertisement in *H.A.*, Vol. 30, No. 2.

Translations made under this scheme, as well as certain translations made by the D.S.I.R. and the N.I.A.E., have been advertised on blue forms inserted in each of the last three numbers of *H.A.* However, loose forms, even the most colourful, easily become lost or mislaid, and it is therefore believed that a more permanent record of the translations available should be published in the body of the journal from time to time.

The first such list is printed below. If you wish to obtain any of the items mentioned, please send your orders direct to us [NOT to C.A.B., Farnham Royal], merely quoting its reference number and enclosing the appropriate sum of money.

Reference No.	Title	Price	Abstract in <i>Horticultural Abstracts</i>
D.S.I.R. RTS. 1342	AZIMOV, R. A. A study of the effect of micro-elements on the distribution of sugars in <i>Fragaria</i> using paper chromatography. [Russian.] <i>Bot. Zhurnal</i> , 1958, 43 : 831-6.	15s.	Vol. 29, No. 186
Q.F. 3779a	BAZIER, J. Control of apple and pear scab. Practical ways of determining the likelihood of infection. [French.] <i>Bull. hort. Liège</i> , 1960, 15 : 39-43, illus.	7s. 6d.	Vol. 30, No. 1931
Q.F. 3769	CASARINI, B., CANO, F., and MARTELLI, R. New fungicides derived from nitrophenols. [Italian.] <i>Ann. Sper. agrar.</i> , 1959, 13 (4), Suppl. pp. I-IX, bibl. 4.	12s.	Vol. 30, No. 1958
Q.F. 3767	CIAMPI, C., and GELLINI, R. Anatomical study of the relationship between structure and rooting capacity in olive cuttings. [Italian.] <i>Nuovo G. bot. ital.</i> , 1958, 65 : 417-24, bibl. 11, illus.	12s.	Vol. 30, No. 1197
Q.F. 3652	DORSMAN, C., and RAVENSBERG, K. Cuttings and grafts under mist spray. [Dutch.] <i>Jaarb. Proefst. Boomkw. Boskoop</i> 1957, pp. 20-31.	12s.	Vol. 29, No. 1660
Q.F. 3693	DOUGLAS, J., and DOESBURG, H. H. The propagation of blueberries by shoot cuttings. [Dutch.] <i>Meded. Dir. Tuinb.</i> , 1959, 22 : 98-104, bibl. 9, illus.	9s.	Vol. 29, No. 2191
Q.F. 3732	DRIJFHOUT, E., and GERRITSEN, C. J. <i>Actinidia chinensis</i> , a new fruit crop. [Dutch.] <i>Meded. Dir. Tuinb.</i> , 1959, 22 : 682-7.	5s.	Vol. 30, No. 3428
N.I.A.E. 54	FLOOR, J. Report on experiments with mist propagation of cuttings. [Dutch.] <i>Meded. Inst. Vered. TuinbGewass.</i> 118 , 1957, pp. 28.	5s.	Vol. 28, No. 1676
Q.F. 3701c	KESSLER, G. On the breeding of the cyclamen variety Rosa von Zehlendorf. [German.] <i>Gartenwelt</i> , 1960, 60 : 53-5, illus.	5s.	Vol. 30, No. 4193
Q.F. 3660	KOMAROV, I. A. Factors influencing the rooting of softwood cuttings of lilac varieties. [Russian.] <i>Bjull. glav. bot. Sada</i> , 1956, No. 26, pp. 38-44.	10s. 6d.	Vol. 28, No. 2939

Reference No.	Title	Price	Abstract in Horticultural Abstracts
N.I.A.E. 25	KREUTZ, W., and SCHUPP, F. Controlling the climate of glasshouses with different ventilation systems by regulating the conditions of air flow. [German.] <i>Gartenwelt</i> , 1956, 56 : 105-7 and 128-30.	4s. 9d.	Vol. 26, No. 2404
N.I.A.E. 31	LAUTHER, S. A modern heating plant. [German.] <i>Gartenwelt</i> , 1956, 56 : 241-2.	1s. 9d.	Included in Vol. 27, No. 49
Q.F. 3779b	LEMBCKE, G. The problem of spraying for scab control, with special reference to an apparatus for measuring surface moisture on leaves. [German.] <i>NachrBl. dtsh. PflSchDienst, Berlin</i> , 1959, 13 : 127-34, bibl. 43.	20s.	Vol. 30, No. 1932
Q.F. 3649	LOEWEL, E. L., SCHANDER, H., and HILDE- BRANDT, W. On the development of methods for early selection in apple breeding. 1. On relationships between leaf and fruit characters in the apple. [German.] <i>Züchter</i> , 1957, 4. Sonderheft, pp. 15-32.	36s.	Vol. 28, No. 1091
Q.F. 3701a	MAATSCH, R., and ISENSEE, H. Germination of cyclamen seed in media of different pH values. [German.] <i>Gartenwelt</i> , 1959, 59 : 363.	1s. 6d.	Vol. 30, No. 2611
Q.F. 3547	MANUEL PATIÑO, V. "Cristobalino", a new technique for hastening the germination of certain seeds. [Spanish.] <i>Agric. trop. Bogotá</i> , 1958, 14 : 587-9.	2s.	Vol. 29, No. 1913
D.S.I.R. RTS. 1220	METLITSKIĬ, L. U., and TSEKHOMSKAYA, V. M. Biochemical nature of physiological diseases of apples. [Russian.] <i>Dokl. Akad. Nauk SSSR</i> , 1958, 122 (5), pp. 863-6.	10s.	Vol. 29, No. 1171
Q.F. 3768	MEZZETTI, A. A non-parasitic shot hole disease of plum. [Italian.] <i>Ann. Sper. agrar.</i> , 1951, 5 : 1003-8, bibl. 2.	9s.	Vol. 22, No. 1335
D.S.I.R. CTS. 626	MIKHAILOV, M. K. Paper chromatography studies of the hydroxy- cinnamic acids in tobacco. [Russian.] <i>Dokl. Akad. Nauk SSSR</i> , 1958, 121 (2), pp. 330-3.	24s. U.K. elsewhere 32s.	Vol. 29, No. 1578
N.I.A.E. 23	RAUTAVAARA, T. The optimum width of glasshouses. [German.] <i>Gartenwelt</i> , 1956, 56 : 242.	1s.	Included in Vol. 27, No. 49
Q.F. 3701b	REEKER, R. Cyclamen growing in peat. [German.] <i>Gartenwelt</i> , 1959, 59 : 325-7, illus.	5s.	Vol. 30, No. 2612
Q.F. 3766	SCHALK, A. Forcing strawberries by artificial light. [Dutch.] <i>Meded. Dir. Tuinb.</i> , 1959, 22 : 375-7, bibl. 2, illus.	3s.	Vol. 30, No. 309
Q.F. 3651	WEISE, R. Air circulation in the vineyard at night. [German.] <i>Weinberg u. Keller</i> , 1957, 4 : 329-39.	15s.	Vol. 29, No. 1242

SALIENT ITEMS, Vol. 30, No. 3.

ENVIRONMENT

Microclimatology:—Figures are now beginning to replace fancies in determining what sort of a climate is to be found beneath the canopy of a shaded cacao plantation (4406).

Atmosphere:—Industrial gases, such as manufactured illuminating gas, are injurious to lawns and trees in towns (4225, 4255), and sulphur dioxide causes injury to fruit and forest trees (3284), also to hops, in which the brewing qualities are impaired (4094). The differential rate of decomposition of chlorophyll *a* and *b* has been suggested as a test for SO₂ injury (3099). Other atmospheric causes of injury described are fluoride pollution and salt spray, both damaging fruit trees (3285, 4287).

Soil and water:—The physical nature of the soil has a major effect on growth, root growth of orange trees, for instance, ceasing when the clay content exceeds 28% (4315). Soil sickness is a more specific problem, which may be partly accounted for by leachates from the leaves or roots (4038, 4303), and which may be counteracted in nurseries and orchards by mulching with grass (3286). Drought is another problem, which, if it occurs 4 to 9 months before anthesis in oil palms, can cause abortion (4467). With coconuts even sea-water irrigation may sometimes be better than no irrigation at all (4425).

Temperature:—A gradual lowering of the temperature can increase the degree of frost resistance attainable (3273). Means of reducing frost damage in the field include clean cultivation and manuring (3289) and, in tea, the use of mats which give better frost protection when fixed 60 cm. above the bushes than when laid upon them (4563). A temperature-controlled intermittent sprinkler is also envisaged, water output depending on the actual needs of a frosty night (3474). Soil heating has shown promise in vine nurseries (3463) but not with glasshouse tomatoes (3911). Studies of temperature sums indicate the importance of choosing the right base temperature (3187) and also the value of using "cold units" in selecting celery that is resistant to bolting (3766).

Light:—The effects of light have been studied in relation to seed germination, earliness, pigment content and sex expression (3950, 4046, 4073, 4154), and the importance of the spectral composition on growth and composition has been emphasized (3129, 3143, 3735). In vines short-day treatment has a dominant effect over other day lengths, the resulting reduction of growth being probably due to the formation of a growth inhibiting substance (3495, 3496).

GROWTH AND REPRODUCTION

Flowering:—Early flowering has been induced in hevea by ring-barking and bending the shoots (4478), and blossoming has been stimulated in litchi trees by girdling or banding with heavy rubber bands (4360). In the tomato the presence of leaves can cause delayed flowering (3923). A relationship between the vitamin E content of leaves, day length and flowering in strawberries needs further elucidation (3411).

Fruit set and development:—Fruit set, at any rate in almonds (3514), is an inherent character, and this prevents the plant from increasing it as a compensation for poor pollination. Also in the almond (3515) total flower and fruit fall has been divided into three main periods, during the second of which the flowers which fall are mainly those which have not been cross-pollinated. Fruit set is also affected by temperature, and in one strawberry variety good setting only occurred within a fairly narrow temperature range (3414). In bright, dry weather thinning of peaches may possibly be more effective if spraying is carried out in the early morning or late evening when sunshine is restricted (3361), and in apples differences in leaf absorption due to temperature or previous light conditions may account for differences in the biological response to thinning agents (3357, 3358). In any case it is worth noting that thinning experiments are less likely to be misinterpreted, if the results are expressed as fruits per cm. of limb circumference rather than as fruits per 100 flower clusters (3359). In early stages the calyx lobes of persimmon fruits prevent fruit fall and encourage development (4366). Fruit development in apples involves such a rapid increase in volume that it would seem that an auxin hypothesis cannot account for it all and that other growth factors must play a part (3150). In tomatoes leaf number and position also appear to affect the development and composition of fruit (3924). Fruit-bearing itself seems to affect the plant adversely by slowing down the movement of carbon assimilates to the roots and thus causing impaired vigour (3899).

Seeds:—It is difficult to understand why citrus seeds from fruit on the north side of trees should have more nucellar embryos than those from the south side, but this finding would seem to be of some importance, since mean embryo number is normally associated with tree vigour (4294).

Growth substances:—Gibberellins still hold pride of place in the popularity "top twenty". Although most experimental results continue to be disappointing to those who look for practical and profitable uses for GA, a few favourable effects can be attributed to its use. Gibberellins have stimulated germination (3165), increased fruit set though with some failure to ripen (3167), replaced stratification (3265, 3333), broken dormancy of peaches though not of apples (3329), inhibited flower initiation and bud burst (3331, 3501, 3502), improved the growth of grape bunches (3503-3505), improved vegetable yields (3890), and overcome arrested floral development in coffee (4449), all potentially useful activities on occasion. More attention is being paid to endogenous, gibberellin-like substances, which appear to participate in growth regulating systems and flowering and can even affect neighbouring plants (3106, 3173-3175). Maleic hydrazide, on the other hand, is in temporary disgrace (3418, 3460, 3499, 3500).

Irradiation:—A fair choice this quarter: gamma rays inhibiting sprouting in onion (3870), X-rays in moderation improving carrots (3881), thermal neutrons providing some new, dark-red apples (3242), and ultrasonic treatment giving larger but less nutritious tomatoes (3905).

BUILDINGS, MACHINERY AND PRACTICAL DEVICES

Greenhouses:—Plastic brings its problems and increasing attention is being paid to various new types for use in greenhouse construction (3206-3210, 3901). Other studies concern greenhouse heating (3212, 3213), cooling (3215, 3216), ventilating (3214) and irrigation (3109).

Machinery and equipment:—Sugar cane (3673, 4499, 4548), hops (4089, 4105, 4106, 4109), and tobacco (3957, 4021, 4022) are well provided for. For other crops harvesting machinery and equipment are described for blueberries, plums and cherries (3371), cabbages, tomatoes and other vegetables (3725), sansevieria (4080), sugar maples (4140), rubber (4493), wattles and cinchona (4619). There are also reports of 3 bulb planters (4182), fog generators for frost protection in coffee (4442), a tensiometer for soil moisture measurement in orchards (3190) and a fibre tensile strength tester (4072).

Packing and grading:—Opinion on the use of cardboard cartons is not unanimous (3373, 4350, 4351); an economical container is described for pineapples (4476). Other items are a firmness meter (3199) and a small fruit grader (3372), and there is a general article on modern cool stores for fruit (3379).

EXPERIMENTAL EQUIPMENT AND TECHNIQUES

Automatic aids:—When we were young it was all so much harder! Today the experimenter has a thermostat to regulate his temperature and R.H. (3201), a time switch to regulate his photoperiod (3203), and a logarithmic sprayer to dilute his herbicides (3636, 3637). He can even give up writing and use a portable punching device for his records (3205).

Other apparatus and techniques:—These include devices for evaluating spray deposits (3617, 4390), delivering irrigation water uniformly on small plots (3192), distributing experimental quantities of herbicide (3635) and for measuring electrical resistance in the tree (3177), light intensity (3200), leaf area (3198) and flower colour (4274). Methods are also described for measuring root density by moisture depletion rates (4316), root growth by the displacement of labelled P (3921), and wood growth by sampling (3437).

For the statistician:—Subjects discussed include a relationship which suggests a law of growth (3184) and the problems attending long-term experiments on perennial crops (3185, 3186).

NUTRITION

Diagnosis:—Although one writer seriously doubts the value of foliar diagnosis as a guide to the nutritional needs of vines (3484) and another prefers bark analysis to leaf analysis in rubber as being less affected by date of sampling (4488), numerous studies on leaf analysis in various crops in relation to maximum performance continue to be made. Figures for N, K, Ca and Mg associated with fruit production are available for apples (3296), and for N in avocados (4289). Apple leaf petioles appear to be more sensitive to P than leaf blades (3300). Foliar diagnosis

as applied to oil palms, olives, coconuts and coffee is discussed in 4380. Tropical crop nutrition based rather differently on an ionic notation, in which anion : cation ratios are used, is also considered at some length in 4379.

Uptake:—The need for more knowledge on the physiology of foliar uptake is emphasized (3116), and physiological aspects of absorption through the root are underlined in studies showing that light favourably affects P uptake (3122) and that mineral salts in general are absorbed and translocated best in periods of rapid transpiration (3121). Direct proof of the uptake of intact chelating agents has been obtained with lemons (3124). An adverse effect of sprinkler irrigation in causing nutrient leaching points to the need for increasing nutrient supplies by about 20% when this method of irrigation is practised (3713). Two examples of unwelcome mineral uptake are of Mg and B from pots in experimental studies (3119, 3487).

Nitrogen:—Several studies comparing various N sources include work on tobacco, in which nitrates and urea were better for total nicotine production than ammonium sulphate (3989). Ammonium sulphate alone is disliked by blueberries and cranberries (3432, 3435). With citrus applications of various N fertilizers were shown to have different results in terms of root density, owing to their effects on soil factors including the water infiltration rate (4305). Finally, it is worth considering that, although sprays of more than normally concentrated urea cause leaf injury, it may sometimes be worth sacrificing late-season photosynthesis in order to get a large dose of organic N into the tree before winter (3299).

Nutrient inter-relationships:—The many inter-relationships between elements as usual provide the most interest as well as the most headaches. Thus heavily mulching coffee with K-rich Napier grass adversely affects Mg uptake (4443); vine roots over-supplied with Cu fail to translocate Fe and chlorosis results (3488); whiptail in cauliflowers can be due to Ca as well as Mo deficiency and to an impaired Ca/Mo balance (3745), and in tomatoes the complicated mutual antagonisms between Mo, Mn and Fe are almost Freudian (3919).

Trace elements:—Studies on single trace element deficiencies are numerous, but there are few high lights. Certain pathogenic diseases appear to be influenced by nutrient deficiencies; thus TMV in tobacco is affected by the Mg and B status (3983, 3986), Ca increases the resistance of tomatoes to southern blight (3944), and silver leaf in plums seems to be associated with Fe availability (3564). Mercury makes a rare appearance as a trace element necessary for ripening and carbohydrate metabolism in the vine (3490). The effects of Mn in deficiency and excess are fully described (3828, 3829), and Fe appears to be more effectively supplied from sprays of organic iron (3305, 3306). Current fears and problems are reflected in two studies of uptake of radioactive fission products (3125, 3126).

PLANT PROTECTION

General:—The vast losses due to pests and diseases are emphasized by such figures as an increase of 20 tons per acre in sugar cane yields achieved by nematode control (4537) and a yield reduction in apples of 14,200 kg./ha. in the year following uncontrolled mildew infection (3552).

Viruses:—Just to be awkward, no doubt, cherry trees of the variety Merton Heart have cropped more heavily when inoculated with viruses prevalent in Britain (3531). Heat treatment of strawberry plants, combined with crown sectioning to provide disc cuttings may be a method of dealing with those viruses so far resistant to heat treatment alone (3541).

Fungi:—Biological control of soil-borne fungi is suggested by studies of competition, mainly for N, between bacteria and the form of *Fusarium oxysporum* causing banana wilt; the outcome of this competition is related to soil pH (4391). Resistance to damping-off in peas is related to the occurrence in the testa of a phenolic compound, which, however, also imparts undesirable colour and taste that are unfortunately linked genetically to the desirable resistance (3834). In castor beans germination performance under conditions favourable to pre-emergence damping-off can be predicted from the conductivity of the seed steep water (4129). Several fungicidal paints for storage buildings show promise in Canada (3221). In Holland daily warnings for scab control can now be obtained from an automatic answering telephone (3558).

Pests:—Soil injection of systemic acaricides under mature apple trees has shown promise for mite control (3572), but with peas the effectiveness of this method of applying systemic insecticides may depend largely on the soil type on which the crop is grown (3835).

Residues:—Danger signals include a report that the use of concentrate mist sprays causes the DDT tolerance limit on cherries to be more quickly reached (3625), and that preserved and frozen

black currants also effectively conserve parathion and malathion residues (3626). Black currants, moreover, are easily spoiled by copper and iron from fungicidal residues in the soil (3623).

Weeds:—Newer herbicides are not without problems. Dalapon, for instance, caused no harm to Cox apples when applied close to trees on M.II stocks but injured those on M.I which has a more compact and surface rooting habit (3646). Dalapon and TCA in bulb fields cleared up annual grasses, but the bulbs showed injury in the second season after spraying (3662). On the other hand, an older herbicide, sulphuric acid, has earned good marks by rendering soil Ca available and thereby improving spinach yields in addition to controlling weeds (3700).

New chemicals and equipment:—An antibiotic from *Helichrysum arenarium* is active against *Corynebacterium* and other organisms (3935, 3936). From Germany a new nematocide, Trapex, is reported, which is also herbicidal, insecticidal and fungicidal, and thus would seem good value for money (4144). Already reported, but still in the news, are Allisan for botrytis control (3848) and the use of silica-aerogels to control red spider mites by destroying their fatty covering, thus causing them to dry up (3581). Several new sprayers and a duster are described (3193, 3194, 3618, 3619), and there are two more reports describing techniques for testing sprayers by means of fluorescent tracers (3195) and for evaluating oils used in banana leaf spot control (3196).

PROPAGATION

Budding:—PVC strips used to tie in apple buds have prevented them from growing away normally (3256). With citrus plants skin grafting of buds on to stocks only $\frac{1}{8}$ in. thick enables budding to be done much earlier than hitherto (4297).

Cuttings:—Tubercles (sphaeroblasts?) containing rudimentary roots and bacteria which enhance rooting ability have been observed on underground as well as on aerial parts of several varieties of apple and quince (3253). Rice husks have proved a suitable medium in which to root cacao cuttings (4403). Softwood tea cuttings have shown better survival when the light was reduced to as little as one-sixtieth of full daylight (4554).

Layering:—Foliar application of 2,4,5-TP has induced vigorous rooting of chestnut layers (3516). Air layers of tea have done better when wrapped in sphagnum moss than in vermiculite (4554). The nurseryman must thank the geneticist for transferring the tip rooting gene from the black to the red raspberry, thus enabling tip layering and leaf bud cuttings to be successful in the latter (3445).

MISCELLANEOUS

Bees' needs:—Catered for by invisible nectar guides and extra-floral secretions (3102, 3103).

Education made painless:—A "gimmick" tree to aid in teaching the art of pruning (3204).

Giddiness:—Plant health undermined by going round and round (3145).

Hope springs eternal:—In some plant breeders (4295).

Humpty-Dumpty:—A sad story of pea volatiles (3839).

Immodesty:—A tune on our own trumpet (3084).

MISCELLANEOUS.

General.

3084. AKENHEAD, D.

The Commonwealth Bureau of Horticulture and Plantation Crops.

Sci. Hort., 1960, **14**: 1-7.

An account of the organization and aims of the Bureau, and of the information service that it provides.

3085. SWARBRICK, T.

The Scottish Horticultural Research Institute.

Sci. Hort., 1960, **14**: 86-9.

A summary of work in progress at Mylnefield, mainly on raspberries and strawberries but also covering black currants, tree fruits and vegetables.

3086. ALBERTA HORTICULTURAL ADVISORY COMMITTEE.

Alberta horticultural guide 1960-1961.

Publ. Alberta agric. Ext. Serv. **92**, 1960, pp. 31.

This guide gives a map of the Province showing the horticultural zones, lists of recommended fruit and vegetable varieties for each zone and information on many hardy ornamentals.

3087. UNION OF SOUTH AFRICA, DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES.

Landboukundige navorsing. (Agricultural research.)

Agricultural research in the Union of South Africa.

[Mimeo. Publs] *S. Afr. Dep. agric. tech. Serv.*, undated, pp. 226 and 23.

The first publication, in Afrikaans, gives an account of the organization of the agricultural departments and research centres in the Union, together with a full annotated list of research projects approved by the Department of Agricultural Technical Services up to 30 June, 1959. It is intended to produce supplementary lists annually. The second publication, in English, gives somewhat fuller information on the agricultural services, but a very abbreviated summary of research projects.

3088. TEN HOUTEN, J. G.

Wageningen Agricultural Centre and the Institute of Phytopathological Research.

Span, 1959, **2**: 89-93, illus.

The history of the Centre and the work of the Institute, of which the author is Director, are described. Appended is a list of the various agricultural research institutes at Wageningen with indications of the scope of their work and the number of scientists working in each.

3089. RAČINSKI, V. V., AND PLATONOV, F. P.

The radioisotope laboratory of the Timirjazev Agricultural Academy. [Russian.]

Izv. Timirjazev. seljsk. Akad., 1959, No. 6, pp. 239-50, illus.

An account of the layout, equipment and organization of the laboratory and of the research work carried out there.

3090. ABCARIUS, E. F.

Report to the Government of Afghanistan on the improvement of fruit production.

Rep. FAO/ETAP 742, Rome, 1957, pp. 15, illus.

The present horticultural situation is described. Recommendations cover the training of personnel, the establishment and work of stations and nurseries, and improved methods of fruit growing, processing and packing. The introduction of carobs is recommended.

3091. ABUDABBEH, N.

Report to the Government of Libya on horticultural development in Cyrenaica.

Rep. FAO/ETAP 951, Rome, 1958, pp. 13, illus.

Recommendations cover the development of bananas in the Derna area, deciduous fruit in the Jebel area, early vegetables, citrus and olives in the Benghazi area, and dates and winter vegetables in the oases. Seed production, plant protection services and horticultural training also need development.

3092. HAUVILLE, A. V.

Rapport au Gouvernement de Yougoslavie sur les techniques de protection des sols contre l'érosion permettant leur mise en valeur par la culture fruitière. (Report to the Government of Yugoslavia on soil conservation measures aimed at the development of fruit growing.)

Rep. FAO/ETAP 819, Rome, 1958, pp. 39.

The situation and needs of Serbia, Macedonia, Bosnia-Herzegovina and Croatia are considered separately, together with general recommendations and diagrams of orchard lay-out.

3093. DEXTER, K.

Horticultural management.

N.A.A.S. quart. Rev., 1960, **11**: 126-31, bibl. 4.

A review, briefly covering the aims of management, the effects of uncertainty and risk, the assessment of a holding's efficiency and profitability, and complete and partial budgeting. Other publications on horticultural management are listed.

3094. BENNETT, L. G.

Small scale horticulture in Hampshire. A study of the financial results of County Council and Land Settlement Association smallholdings in 1957.

Misc. Studies Dep. agric. Econ. Univ. Reading **15**, 1959, pp. 38, bibls, 3s. 6d.

A survey of 3 groups of smallholdings.

Climate and air pollution.

(See also 3279-3281, 3284, 3285, 3470, 3473, 3740, 4255.)

3095. WITTERSTEIN, F.
Bedeutung und Aufgaben des Phänologischen Dienstes. (**The importance and aims of the phenological service [in West Germany].**)
Mitt. dtsh. Wetterdienst., 1960, 3(19): 2-22, bibl. 14, maps.

Work includes observations on many fruits, nuts and ornamental plants.

3096. OTTMAR, D.
Beiträge zur Phänologie Spaniens auf Grund der phänologischen Beobachtungen des Spanischen Wetterdienstes 1943-1954. (**Contributions to the phenology of Spain based on the phenological observations of the Spanish Meteorological Service 1943-1954.**) [English summary 14 lines.]
Ber. dtsh. Wetterdienst., 1960, 9(60): 2-27, bibl. 44, maps.

The maps presented are based on the phenological records of 6 events: almond blossoming, apple blossoming, sowing of maize, harvesting of winter wheat, harvesting of grape vines and the dropping of fig leaves.

3097. VON POGRELL, H., AND KIDDER, E. H.
The effectiveness of water use in sprinkler irrigation for frost protection.
Quart. Bull. Mich. agric. Exp. Stat., 1959, 42: 323-30, bibl. 5.

Laboratory tests conducted under simulated radiation frost conditions showed that the effectiveness of the freezing water was increased by increasing the precipitation rate and also the frequency of application. In the field a precipitation rate of 0.1 in./hr. applied at 60 sec. intervals protected low growing crops against temperatures as low as 23° F. in radiation frosts.

3098. VON POGRELL, H., AND KIDDER, E. H.
The effect of varying temperatures, application rates, and spraying frequencies on leaf runoff under simulated radiation frost conditions.
Quart. Bull. Mich. agric. Exp. Stat., 1959, 42: 428-33, bibl. 2.

In a study of the amount of water required for frost protection, a piece of aluminium 1 in. square was used to simulate a leaf. Whether the simulated leaf was horizontal or at an angle, decreasing temperatures from 28° to 18° F. caused a decrease in run-off. Compared with a simulated leaf placed at an angle at which run-off occurred from the start of the sprinkling, the run-off from the horizontal leaf occurred much later and only when the application rate was higher than 0.15 in./hr. In general, increasing precipitation rates caused an

increase of leaf run-off, whether the leaf was horizontal or at an angle. The frequency of sprinkling seemed to have no effect on the run-off under horizontal leaf conditions, and only a slight effect if the leaf was at an angle.

3099. MÜLLER, J.
Spezifischer Nachweis von SO₂-Rauchschäden an Pflanzen mit Hilfe von Blattpigmentanalysen. (**The specific determination of SO₂ smoke injury to plants with the aid of leaf pigment analyses.**)
Naturwissenschaften, 1957, 44: 453, bibl. 2.

The differential rate of chlorophyll *a* and chlorophyll *b* decomposition is suggested as a specific test for SO₂ injury to plants. The experiments were carried out with *Abies alba*.—Forstbot. Inst., München.

Pollen and bees.

(See also 3888, 3905, 4187, 4217.)

3100. MÜNZNER, R.
Untersuchungen zur Physiologie von Pollenkeimung und Schlauchwachstum unter besonderer Berücksichtigung der Borsäurewirkung. (**Studies on the physiology of pollen germination and tube growth, with special reference to the action of boric acid.**)
Biol. Zbl., 1960, 79: 59-84, bibl. 42, illus.

Pollen germination and tube growth were stimulated by boric acid in over 60 species of Angiosperms and also in some Gymnosperms. Evidence suggests that boric acid plays a part in the wall structure of the tube membrane.—Bot. Inst. tech. Hochsch. Karlsruhe.

3101. TUPÝ, J.
Callose formation in pollen tubes and incompatibility. [Czech and Russian summaries $\frac{1}{2}$ p. each.]
Biol. Plant., Prague, 1959, 1: 192-8, bibl. 13, illus.

Experiments with self-sterile *Nicotiana glauca* and Lord Lambourne apple trees showed that in pollen tubes, which cannot grow because of incompatibility, there was at least twice as much callose per unit length as in normally growing compatible tubes. In apple this was primarily due to the greater length of the callose plugs; in tobacco it was due also to their greater density. The callose formation in incompatible pollen tubes is not a primary result of incompatibility but is directly related to the inhibition of their growth. A specific and simple method of staining pollen tubes in stylar tissue with resorcin blue is described.—Czech. Acad. Sci., Prague.

3102. NISHIDA, T.
Extrafloral glandular secretions, a food source for certain insects.
Proc. Hawaii. ent. Soc., 1958, 16: 379-86, from abstr. in *Bee World*, 1960, 41: 15.

Nectar-secreting glands on the stem, petiole, vein, peduncle, calyx, seed pod or axis of the inflorescence of 7 Hawaiian plants, including *Ricinus communis*, *Cattleya* spp., *Spathoglottis* spp., *Prunus persica* and *Passiflora edulis flavicarpa*, attract many species of insects, including honeybees.

3103. DAUMER, K.

Blumenfarben, wie sie die Bienen sehen.
(**Flower colours as seen by bees.**)

Z. vergl. Physiol., 1958, **41**: 49-110, from abstr. in *Bee World*, 1960, **41**: 49-50.

The appearance of flowers as seen by bees was studied by photographing them through filters approximating to the colour sensitivity characteristics of the bee's eyes. Ultra-violet light revealed "nectar guide" patterns invisible to the human eye.

Seeds.

(See also 3165, 3707-3710, 3731, 3787, 3817, 3822, 3823, 3842, 3884, 3937, 3966, 3967, 4403.)

3104. HEYDECKER, W.

Problems of seedling establishment in the field.

Sci. Hort., 1960, **14**: 63-74, bibl. 17.

A review of some recent literature on the quality of the seed, diseases attacking the seed (with recommendations for vegetable seed dressings), the germination process, physical causes of failure to emerge, nutrition and competition. [A full bibliography can be obtained from the author.]

3105. COOPER, C. C.

Polyethylene protective seed packages.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 569-79, bibl. 4.

Polythene film of various thicknesses was tested as a material for seed packages, wheat, maize and cucumber being used as the test seeds. Completely sealed polythene film of 5 and 10 mils thickness was found to make an excellent moisture-resistant package for dry seeds. Only slight additional protection against moisture absorption was obtained by the use of thicknesses greater than 10 mils. The choice between a thickness of 5 and 10 mils will be determined largely by the physical strength required for the package. Thin polythene film of 1.5-2.0 mils served a useful purpose as a short-term marketing package but should not be used where a moisture-resistant package for long-term storage is required.—Union Carbide Plastics Co., Bound Brook, N.J.

3106. KNAPP, R.

Bedeutung der Gibberelline für eine gegenseitige Beeinflussung von Pflanzen. (**The significance of gibberellins in the interaction of plants on one another.**)

Naturwissenschaften, 1959, **46**: 657, bibl. 6.

Seeds of *Tagetes patula*, germinating in the presence of germinating seeds of *Phaseolus vulgaris* var.

communis, showed the same elongation of hypocotyls as after treatment with GA. It is suggested that the GA present in bean seeds acts on other seeds germinating near them. The inhibition of *Tagetes* root growth, which was also noted, could not be attributed to the presence of GA in bean seeds.—Bot. Inst., Univ. Giessen.

Vegetative propagation.

(See also 3253, 4251, 4252, 4269, 4275, 4280, 4282.)

3107. NEWTON, P.

Physiological aspects of mist propagation.

Sci. Hort., 1960, **14**: 75-80, bibl. 17.

A discussion, with reference to the literature, on how environmental conditions under mist affect the physiological activity of cutting material.

Irrigation.

3108. TURCK, G.

A guide to irrigation farming.

Rhod. agric. J., 1960, **57**: 1-45, illus.

A comprehensive account of the principles and practice of irrigation is given under 10 headings, with 6 annexes of useful operational and constructional information. The water requirements of crops, including tobacco and vegetables, are listed. Considerable space is devoted to methods of overhead spray irrigation and to the row, basin and terrace irrigation of orchards. The fertilizer requirements of certain crops under irrigation are also indicated.

3109. MINISTRY OF AGRICULTURE, LONDON.

The low-level sprinkler irrigation system for use under glass.

Hort. Mach. Leaflet. Minist. Agric. Lond. **3**, 1959, pp. 8, illus.

Layout, construction and operation of a system which can be made in the nursery from standard components, including modifications to suit individual crops.

3110. EHLIG, C. F., AND BERNSTEIN, L.

Foliar absorption of sodium and chloride as a factor in sprinkler irrigation.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 661-70, bibl. 13.

Five species of fruit trees were grown in sand culture on a non-saline nutrient solution and sprinkled with waters of graded salinity to determine rates of foliar accumulation of ions and leaf injury. Root media were protected from salt contamination. Leaves of Texas almond, Royal apricot, Santa Rosa plum and Washington Navel orange accumulated injurious amounts of chloride and Na from sprinkler-applied salt solutions, but Fuerte avocado did not. Almond, apricot and plum leaves developed tip-burn, and orange leaves lost their high gloss and colour and occasionally developed tip-burn, at concentrations of 5 or

10 me./l. of NaCl, CaCl₂ or Na₂SO₄ in the sprinkler-applied waters. Partial to complete defoliation of almond, plum and orange occurred in the high NaCl and CaCl₂ treatments after 59 hours of sprinkling. Foliar absorption of Na and chloride was most rapid in apricot and almond, intermediate in plum and orange, and very slow in avocado. Plum leaves were injured at lower foliar concentrations of chloride and Na than the other species. The range of toxic concentrations was approximately 10 to 30 me. per 100 g. dry weight. All species accumulated Na more slowly from Na₂SO₄ solutions than from NaCl solutions. Chloride accumulation from NaCl and CaCl₂ was equal. Evening applications of NaCl resulted in lower Na and chloride accumulation and correspondingly less leaf injury than mid-day applications. The Ca content of the leaves was increased by the CaCl₂ treatments, while Mg and sulphate were not markedly affected by the sprinkler treatments. K was appreciably affected only in almond leaves, in which it decreased with increasing Na accumulation. Vegetables and forage crops showed little or no injurious effects of sprinkling with waters containing as much as 96 me./l. of NaCl. [From authors' summary.]—U.S. Salinity Lab., U.S. Dep. Agric., Riverside, Calif.

Composts and mulches.

3111. SPYRA, E., AND GLAS, T.
Ertragsversuche mit Komposten, die mit Edafil geimpft wurden. 1. Vorbericht. (Results with composts impregnated with Edafil. 1. Preliminary report.) [English and French summaries $\frac{1}{4}$ p. each.]
Gartenbauwiss., 1959, 24: 88-103, bibl. 6, illus.

Edafil is described as a substance for soil inoculation, which contains not only certain amounts of major and minor nutrient elements, but also dried forms of microorganisms capable of promoting fermentation, e.g. soil bacteria, fungi, algae and protozoa. Composts inoculated with it showed more rapid decomposition of their vegetable contents and hence could be brought into use sooner. Experiments with a number of small fuchsia, ageratum, lettuce and kohlrabi plants showed the good effects of the treated compost on growth. This was more noticeable in the greenhouse than in the open.

3112. BAUMANN, E.
Versuche zur Kompostierung von Wirtschaftsfällen des Gemüsebaues mit verschiedenen Zuschlagstoffen. (Experiments on the composting of vegetable refuse with different substances.) [Russian and English summaries 14 and 10 lines.]
Arch. Gartenb., 1959, 7: 607-34, bibl. 33, illus.

A 2 : 1 vegetable refuse : peat mixture was the best of several mixtures tested.

3113. RATHSACK, K., AND JUNGK, A.
Die Ammonifikation und Nitrifikation des in Malzkeimen gebundenen Stickstoffs im Torf. (Ammonification and nitrification of the nitrogen contained in malt germs introduced into peat.) [English and French summaries $\frac{1}{3}$ p. each.]
Gartenbauwiss., 1959, 24: 76-87, bibl. 29.

In connection with azalea manurial trials, the nitrogen in malt germs mixed in peat was examined at different times and analyses were made of the NH₄ and NO₃ nitrogen present. A considerable increase in pH value was noted during the decomposition of the malt germs. At an initial pH of 3.9 the addition of 3 g. of malt germs per litre of peat produced an increase in pH of 0.2 and 0.3. This increase was caused by immediate and rapid ammonification. Within the observed periods of 12 to 24 weeks 50 to 60% of the total N in the malt germs became ammonified. After more than 100 days nitrification began at pH values over 5.7. As it increased so the pH value fell, eventually reaching a level of pH 4.3.—Tech. Hochsch., Hannover.

3114. KIRSCH, R. K.
Effects of sawdust mulches. I. Soil properties. ROBERTS, A. N., AND MELLENTHIN, W. M.
Idem. II. Horticultural crops.
Tech. Bulls Ore. agric. Exp. Stat. 49, 1959, pp. 16, bibl. 9, and 50, 1959, pp. 34, bibl. 64.

The effects were studied of douglas fir and alder sawdust applied as a mulch or incorporated into the soil surface, with or without fertilizers, on soil pH, nutrient status, organic matter, aggregation and moisture. The crop studies were carried out over an 8-year period. Sawdust was superior to straw or oak leaves as a mulch for blueberries and azaleas, and any type of mulching was superior to clean cultivation. Yields of raspberries were not increased by mulching with any of the materials. Strawberry yields were increased by sawdust mulching except when red stele disease was present, when sawdust and/or N encouraged the development of the disease. Sawdust mulching did not increase the fertilizer requirements of strawberries. Incorporation of fir sawdust, however, required a total addition of 10-15 lb. N per ton, applied over a 4-5-year period in decreasing amounts, for satisfactory growth of tomatoes. Alder sawdust, mixed with the soil, required less additional N than fir. The incorporation of alder sawdust increased tomato yields after the second year and increased crop responses to applied P and K, but the incorporation of fir sawdust did not increase tomato yields at all over a 5-year period.

3115. JUDKINS, W. P.

Sawdust as a mulch.

Circ. Va Polytechnic Inst. Ext. Serv. **650**, revised 1960, pp. 8, illus.

Recommendations for the home gardener.

Nutrition.

(See also 3487, 3490, 3828, 3829, 4318.)

3116. MIDDLETON, L. J.

The absorption of fertilizers by leaves.

New Biol., 1959, No. 30, pp. 91-102, illus.

A discussion of what is known of the method of absorption by leaves—very little—and of the pros and cons of applying nutrients in this way. Only when more is known of the mechanism of absorption is the efficiency of foliar spraying likely to be enhanced by improvements in formulation and technique.

3117. TUKEY, H. B.

Practical implications of nutrient losses from plant foliage by leaching.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 671-6, bibl. 21.

A discussion on the ways in which the leaching of nutrients from leaves [see *H.A.*, 30: 1533] can affect plant performance or horticultural practices, such as sampling for leaf analysis, quality and composition of crops, rooting of cuttings under mist, irrigation, and susceptibility to pests and diseases.

3118. O'KELLEY, J. C.

Boron and plant growth.

New Biol., 1959, No. 30, pp. 103-11, bibl. 9, illus.

A general discussion of results with flowering plants and with isolated plant cells, and a note on some of the theories advanced.

3119. ROBERTS, F. J.

The magnesium supplying power of glazed porcelain pots.

J. Aust. Inst. agric. Sci., 1959, **25**: 298-9, bibl. 3.

Plants were grown without Mg in glazed porcelain pots coated with a plastic film and in similar but uncoated pots. Symptoms of Mg deficiency developed in the plants in the plastic-coated pots but not in those in the untreated ones. There is evidence that the plants received sufficient Mg from the pot material for satisfactory growth. It is concluded that in nutrition experiments rigid precautions should be taken to prevent contamination from the pot.—*Inst. Agric.*, Univ. W. Aust., Nedlands.

3120. KURSANOV, A., AND KULAEVA, O.

Root metabolism and the assimilation of ammonia by phosphorus-deficient plants. [Russian?]

Agrochimica, 1958-59, **3**: 29-38, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: i-113.

Products of photosynthesis in young pumpkin plants are translocated to roots largely as sucrose, from which organic acids and amino-acids are synthesized and carried upwards in the sap. P deficiency lowers the intensity of the Krebs' cycle reaction and the dark fixation of CO₂, and glyoxylic acid accumulates. Supplying NH₃ to P-deficient roots results in the abnormal production of amides, guanidine derivatives and allantoin, protein synthesis from which is less satisfactory. The addition of P rapidly restores normal metabolism.

3121. AHMAD, R.

The role of transpiration in the absorption and translocation of mineral ions in plants, as measured with radioactive calcium and phosphorus.

Diss. Abstr., 1959, **20**: 1989, being *L.C. Card No. Mic.* 59-5877 of 71 pp.

One set of cotton and bean plants was kept in a slightly sub-optimal nutrient solution during day-time and in distilled water during the night. With another set of plants this treatment was reversed. Plants kept in the nutrient solution during the day period of rapid transpiration grew much better than those kept in the solution during the night period of low transpiration, suggesting that a higher rate of transpiration during the time of mineral salt availability was responsible for the greater rate of translocation. In other experiments Ca⁴⁵⁺⁺ and HP³²O₄⁻⁻⁻, absorbed under conditions of high transpiration, were found to be immediately available for translocation, though the movement of Ca was slower than that of P and there was no correlation between the Ca : P ratio in the different plant organs.

3122. GRODZINSKJI, A. M., AND SYTNIK, K. M.

New data on the effect of light on the uptake of nutrients by plants. [Ukrainian, with Russian and English summaries 7 lines each.]

J. Bot. Acad. Sci. Ukr., 1959, **26**(4): 13-18, bibl. 12, illus.

Experiments with tomatoes and other plants substantiated the theory that light has a favourable effect on P uptake. In pot experiments with tomato and bean plants a similar effect of light was observed on the accumulation of labelled Ca in leaves.

3123. WINTER, A. G., PEUSS, H., AND SCHÖNBECK, F.

Untersuchungen über die Aufnahme organischer Substanzen durch die Wurzeln höherer Pflanzen. I. Phenolische Verbindungen. II. Phenol. (Studies on the uptake of organic substances by the roots of higher plants. I. Phenolic compounds. II. Phenol.)

Naturwissenschaften, 1959, **46**: 536-7, bibl. 8. Phenol was absorbed and translocated.

3124. LEONARD, C. D., STEWART, I., AND EDWARDS, G.

Citrus nutrition studies.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 198-9.

Soil application of zinc: [Essentially the same as reported in *H.A.*, 29: 1823.] *Absorption of chelating agents*: Direct proof of the uptake of intact chelating agents by plants has been obtained for the first time with rough lemon seedlings provided with C^{14} -labelled NaEDTA.

3125. ROMNEY, E. M., AND OTHERS.

Some environmental factors influencing radio-strontium uptake by plants.

Plant and Soil, 1960, 12: 41-8, bibl. 18.

The amount of Sr^{90} taken up from a loam soil varied among several different crop plants by a factor as high as 10 on the basis of dry weight. Among 10 plants tested Sr^{90} uptake was highest in turnip and lowest in spinach. Lowering root temperature from 17° to 7° C. significantly reduced Sr^{90} uptake by beans. Q_{10} values indicated that strontium uptake was chemically controlled rather than the result of physical phenomena. A decrease in light intensity from 1,000 to 450 f.c., and a decrease in the light-exposure period, also reduced Sr^{90} uptake by beans.—Univ. Calif., Los Angeles.

3126. GULJAKIN, I. V., AND JUDINCEVA, E. V.

Accumulation of radioactive fission products in different plants in relation to soil conditions.

[Russian, with English summary 9 lines.] *Izv. Timirjazev. seljsk. Akad.*, 1959, No. 6, pp. 19-38, bibl. 20.

Peas were valuable for purifying light sandy soils from Sr^{90} . In medium and heavy loams the uptake of this element was very much reduced. Peas were of no value in purifying the soil from Cs^{137} , as uptake of this element from all soils was negligible. [See also *H.A.*, 28: 1039 and 29: 3203m.]

Plant composition.

(See also 3881.)

3127. SCHUPHAN, W.

Das Vorkommen der für Mensch und Tier essentiellen Aminosäuren in Vitalzonen (Aktivzonen) und in Speichergewebe einiger niederen und höheren Pflanzen. (The occurrence of amino acids essential for man and beast in vital (active) zones and in the storage tissues of some lower and higher plants.) [English and French summaries 21 and 22 lines.]

Qual. Plant. Maveg., 1960, 6: 199-233, bibl. 18, illus.

The evaluation of some 15,000 determinations of

essential amino acids (EAA) in food plants led to the following conclusions: The terms "essential amino acids" and "EAA-index according to B. L. Oser", hitherto confined to human and animal nutrition, should be extended to cover the nutrition of plants. Active plant tissues, in which cell division or other important processes are taking place, accumulate essential amino acids rather than crude protein; the accumulation of essential amino acids is a prerequisite of the high biological value of proteins expressed as the EAA-index. Other plant tissues, e.g. storage tissues, have low EAA-indices. It is suggested that, in view of their nutritional importance, the active plant tissues be called vital or active zones. Detailed reference is made to the composition of kale and spinach.—Bundesanst. Qualitätsforsch. pflanzl. Erzeugn., Geisenheim/Rhg.

3128. GENEVOIS, L.

Proteine und Fermente in chlorophyllführenden Zellen. (Proteins and enzymes in chlorophyll-containing cells.)

Qual. Plant. Maveg., 1960, 6: 192-7, bibl. 18.

The same enzymes were found in chlorophyll-containing cells as in yeast and muscles, thus accounting for the high nutritional value of plant cells containing chlorophyll.

3129. RUGE, U.

Der Vitamin-B-Gehalt von Tradescantia-Blättern in Abhängigkeit von der Wellenlänge des Lichtes. (The vitamin B content of Tradescantia leaves in relation to the wave length of light.)

Naturwissenschaften, 1959, 46: 428, bibl. 2.

As the relationship between wave length and vitamin B_1 content is very similar to that between wave length and respiration, it seems likely that vitamin B_1 is synthesized or activated *via* respiration.—Inst. Bot. tech. Hochsch., Hannover.

3130. ČIKALOVA, E. A.

The accumulation of ascorbigen in plants. [Russian.]

Fiziol. Rast., 1959, 6: 724-5, bibl. 8.

The highest ascorbic acid content of lettuce leaves and radish leaves and roots resulted from seed or seedling treatment with ascorbic acid and with ascorbic acid + indolylacetic acid, but the accumulation of ascorbigen was greatest following treatment with indolylacetic acid alone.

3131. GRIFFITHS, L. A.

On the distribution of gentisic acid in green plants.

J. exp. Bot., 1959, 10: 437-42, bibl. 19.

In many species, including a number of economic crops. [See also *H.A.*, 29: 7.]

3132. GULICH, L.

Veränderungen in der Nucleinsäure-Fraktion grüner Blätter im Zusammenhang mit photoperiodischer Induktion. (**Changes in the nucleic acid fraction of green leaves in relation to photoperiodic induction.**)

Planta, 1960, **54**: 374-93, bibl. 56.

In *Kalanchoe blossfeldiana*.

3133. SISAKJAN, N. M., ODINCOVA, M. S., AND ČERKAŠINA, N. A.

The nucleotide composition of ribonucleic acid in cellular structures of plants. [Russian, with English summary $\frac{1}{2}$ p.]

Biohimija, 1960, **25**: 160-3, bibl. 19.

The RNA of the cytoplasm of pea shoots and of the chloroplasts of certain other plants, including tobacco and spinach, belong to the GC (guanine-cytidine) type.

3134. VANJUŠIN, B. F., AND BELOZERSKIJ, A. N.

The nucleotide composition of desoxyribonucleic acid in higher plants. [Russian.]

Doklady Akad. Nauk S.S.S.R., 1959, **129**: 944-6, bibl. 10.

The DNA of vascular plants belongs to the AT (adenine-thymine) type.

Tissue culture.

3135. SHANTZ, E. M., AND STEWARD, F. C.

Investigations on growth and metabolism of plant cells. VII. Sources of nitrogen for tissue cultures under optimal conditions for their growth.

Ann. Bot. Lond., 1959, **23**: 371-90, bibl. 32.

Tissue cultures from explants of carrot root and potato tuber, stimulated into rapid growth by the addition of coconut milk or *Aesculus* liquid endosperm to the medium, become to a certain degree heterotrophic for nitrogen. Maximum growth-rates are attained only when nitrate is supplemented with various reduced N compounds. The effects of casein hydrolysate, amino-acid mixtures, ammonia, tryptophan, urea and allantoin have been investigated, and their possible biochemical roles are discussed. [Authors' abstract. See also *H.A.*, 28: 2147g.]—Cornell Univ., Ithaca, N.Y.

3136. KOBLITZ, H.

Über die unterschiedlichen Wirkungen der stimulierenden Stoffe aus der Cocosmilch und dem festen Endosperm der Cocosnuss auf Gewebekulturen. (**On differences in their effect on tissue cultures between the stimulating substances of coconut milk and the solid endosperm of coconut.**)

Naturwissenschaften, 1958, **45**: 447-8, bibl. 4, illus.

The substances were tested on carrot tissue cultures. Extracts of solid coconut endosperm promoted

both growth and root formation.—Inst. Faserstoff-Forsch., Teltow-Seehof.

3137. ČAJLAHJAN, M. H., AND BUTENKO, R. G.

The influence of adenine and kinetin on the differentiation of flower buds in isolated tops of perilla plants. [Russian.]

Doklady Akad. Nauk S.S.S.R., 1959, **129**: 224-7, bibl. 9, illus.

Apical buds of *Perilla nankinensis* were cultured on White's medium under sterile conditions. Flower buds developed under short-day conditions but not in long days. The addition of adenine (0.001 g./l.) or kinetin (0.001 g./l.) to the medium, however, induced flower bud formation in long-day conditions. The authors suggest that there is a period, before a large leaf area is produced, when development is controlled by substances absorbed from the growing medium rather than by substances synthesized in the leaves.

Physiology and metabolism.

(See also 3411, 3415, 3495, 3496, 3631, 3711, 3821, 3825, 3827, 3886, 3926, 4186, 4318, 4602.)

3138. LUCKWILL, L. C.

The physiological relationships of root and shoot.

Sci. Hort., 1960, **14**: 22-6, bibl. 3.

The problem is discussed of how the growth rates of root and shoot are regulated to maintain a favourable balance between sugar supplies and N intake.

3139. ČAJLAHJAN, M. H., AND AKSENOVA, N. P.

The relationship between photoperiodism and respiration in plants. [Russian, with English summary $\frac{1}{2}$ p.]

Fiziol. Rast., 1959, **6**: 699-708, bibl. 27.

Long-day plants, including *Rudbeckia bicolor* and *Nicotiana silvestris*, and short-day plants, including *Perilla nankinensis* and the tobacco variety Mammoth, were grown for 1 to 3 months at unfavourable day lengths and then for 3 to 17 days at favourable day lengths. The change rapidly affected the diurnal variation in both the respiration rate and oxidase activity. Photoperiodic induction of flowering led to an increase in the activity of the oxidases containing heavy metals in the long-day plants, whereas in short-day plants it increased the rate of residual respiration.

3140. YAMAGUCHI, A.

Increased respiration of leaves bearing necrotic local virus lesions.

Virology, 1960, **10**: 287-93, bibl. 6.

The maximum increase in the respiration rate of leaves of *Datura stramonium* infected with TMV, *Vicia faba* infected with cucumber MV and *Gomphrena globosa* infected with PVX occurred 3 days after inoculation. The persistence of these enhanced respiration rates is attributed to the

accumulation of substances involved in respiratory processes around the necrotic lesions.—Nagoya Univ., Anjo, Aichi-ken, Japan.

3141. TIMSON, J.

Variegated foliage.

New Biol., 1959, No. 30, pp. 31-46, bibl. 5, illus.

Types and causes discussed.

3142. BOPP, M., AND TAUCHMANN, G.

Über die Anthocyanverteilung in bunten Laubblättern. (On the distribution of anthocyanin in coloured foliage leaves.)

Naturwissenschaften, 1958, **45**: 265-6, bibl. 5, illus.

The relationship between silvery leaf spots, anthocyanin distribution and illumination explored.

3143. KANDELER, R.

Über die Wirkung von Dunkelrot- und Weisslicht auf die Anthocyanbildung nach Ausschaltung der Chlorophyllbildung durch Antibiotika. (On the effect of deep red and white light on anthocyanin formation after the elimination of chlorophyll formation by antibiotics.)

Naturwissenschaften, 1959, **46**: 452-3, bibl. 5.

In *Brassica* spp. and *Sinapis alba*.

3144. KRASNOVSKIJ, A. A., AND BYSTROVA, M. I. **Studies on chlorophyll formation in the homogenates of etiolated leaves with the use of fluorescent spectrophotometry.** [Russian, with English summary $\frac{1}{2}$ p.]

Biohimija, 1960, **25**: 168-79, bibl. 18.

Homogenates of etiolated bean leaves were found to contain two protochlorophylls, one completely transformed into chlorophyll by illumination and the other only partially so converted. [See also *H.A.*, 30: 1544.]

3145. JONES, R. L.

Response of growing plants to a uniform daily rotation.

Nature, 1960, **185**: 775.

Plants were continuously rotated in one direction about a vertical axis at the rate of 1 revolution a day. The leaves of cyclamen rotated clockwise lost turgidity, yellowed and died, but plants rotated anti-clockwise were as healthy and turgid as stationary ones. Scarlet runner beans, which normally twine anti-clockwise, did not twine around their supports when rotated anti-clockwise. Those rotated clockwise twined, but their leaves lost turgidity, became yellow and died. Transference to anti-clockwise movement caused partial or full recovery.—D.S.I.R., Lower Hutt, N.Z.

3146. SONDHEIMER, E., AND GRIFFIN, D. H.

Activation and inhibition of indoleacetic acid oxidase activity from peas.

Science, 1960, **131**: 672, bibl. 12.

Inhibition by chlorogenic acid and activation by pea-epicotyl extracts and by *p*-coumaric acid.

3147. VAKLINOVA, S.

Transamination of glutamic acid in leaf homogenates of certain plants. [Russian, with English summary 5 lines.]

C.R. Acad. bulg. Sci., 1959, **12**: 533-5, bibl. 7, illus.

The aminophorases, which transaminate glutamic acid, were found to be most active in the leaves of tomato, less active in those of bean and weakest in pea leaves.

3148. POPOV, V. R.

The enzymatic oxidation of phloroglucinol in plants. [Russian.]

Biohimija, 1960, **25**: 273-5, bibl. 15.

3149. WALKER, D. A.

Physiological studies on acid metabolism. 7. Malic enzyme from *Kalanchoë crenata*: effects of carbon dioxide concentration.

Biochem. J., 1960, **74**: 216-23, bibl. 29.

Carbon dioxide accelerated the reductive carboxylation of pyruvate and retarded the oxidative decarboxylation of malate.

Growth substances.

(See also 3265, 3325-3333, 3357, 3358, 3363, 3364, 3418, 3460, 3499-3505, 3631, 3784, 3789, 3927, 3928, 3989, 4002, 4006, 4149, 4157, 4174, 4176, 4235, 4242, 4261, 4268, 4281, 4284, 4312, 4322, 4355, 4433, 4449, 4477, 4514, 4563, 4564, 4566.)

3150. LUCKWILL, L. C.

Factors controlling the growth and form of fruits.

J. Linn. Soc. (Bot.), 1959, **56**: 294-302, bibl. 34.

Examples are quoted of the rapid volume increases occurring in the development of fruits, e.g., apple fruits may increase in volume 6,000 times in 20 weeks. A survey of the literature concerning the effects of seeds and auxins on fruit growth suggests that the "auxin hypothesis" may have to be modified, and that there may be other types of growth factor, besides auxins, which occur in seeds and which might be active, either alone or in combination with auxin, in stimulating fruit growth.—Long Ashton Res. Stat., Bristol.

3151. HESLOP-HARRISON, J.

Growth substances and flower morphogenesis.

J. Linn. Soc. (Bot.), 1959, **56**: 269-81, bibl. 57, illus.

A survey of present-day knowledge.

3152. FERENCZY, L.

Studies on precursors of indolylacetic acid. 1. On the auxin activity of tryptamine.

Naturwissenschaften, 1959, **46**: 208, bibl. 3.

The roots and coleoptile and hypocotyl sections of

numerous plants, including carrot and radish, were treated with TNH_2 in order to compare it with IAA. TNH_2 showed characteristic auxin activity, though rather less than that of IAA. It is suggested that TNH_2 can be transformed by enzyme action into IAA within the cells.

3153. VARGA, M., AND KÖVES, E.
Vorkommen, Verteilung und quantitative Veränderung des β -Inhibitors in den einzelnen Organen der Bohnenpflanze. (**Incidence, distribution and quantitative changes of the β -inhibitor in individual organs of the bean plant.**)
Naturwissenschaften, 1958, **45**: 468-9, bibl. 7.

3154. LIBBERT, E., AND BALLIN, G.
Vorkommen, Wirksamkeit und fermentative Umsetzung des Indol-3-acetonitrils in verschiedenen Pflanzen. (**Incidence, activity and conversion by enzymes of indole-3-acetonitrile in different plants.**)
Naturwissenschaften, 1959, **46**: 532-3, bibl. 6.
Including 6 vegetables and ornamentals.

3155. KLINGENSMITH, M. J.
A physiological study of the effect of certain benzazoles on higher plants.
Diss. Abstr., 1959, **20**: 1555-6, being *L.C. Card No. Mic.* 59-4943, of 161 pp.

A number of benzazoles, in particular benzimidazole, benzothiazole and benzotriazole, were examined for their effects on the growth and on the water and mineral uptake of plants, including cucumbers, bush beans and tomatoes. Some of the changes brought about by the benzazoles were unlike those produced by other growth substances.—Univ. Mich.

3156. NARAYANASWAMI, S.
Influence of maleic hydrazide on plant growth.
Sci. and Cult., 1960, **25**: 460-3, bibl. 20.

The effects of MH as an inhibitor of mitosis, respiration and phloem differentiation in plants, including vegetables, fruits and ornamentals.

3157. HACCUS, B., AND MASSFELLER, D.
Durch Phenylborsäure induzierte Reduktion der Petalen bei *Cucumis sativus*. (**Reduction of petals in *Cucumis sativus* induced by phenylboric acid.**)
Naturwissenschaften, 1959, **46**: 585-6, bibl. 1, illus.

The treatment of young seedlings with phenylboric acid caused a reduction in the number of petals formed in cucumber, *Kalanchoe* and *Pelargonium* plants.—Bot. Inst., Univ. Mainz.

3158. RAKITIN, JU. V., AND OTHERS.
The structure and physiological activity of some 2,4,5-trichlorophenoxyacetyl amino acids. [Russian.]
Fiziol. Rast., 1959, **6**: 729-34, bibl. 16.

The physiological activities of sixteen 2,4,5-trichlorophenoxyacetyl amino acids were compared with that of 2,4,5-T by soaking radish and wheat seeds in concentrations of 0.1 to 0.0001% for 24 hours and measuring root and shoot growth. Almost all the compounds had a greater inhibitory effect than 2,4,5-T on the growth of radish seedlings at 0.1–0.001% concentrations. At 0.0001% the dl-valine, dl-serine and dl-asparagine derivatives stimulated both root and shoot growth, as also did 2,4,5-T.

3159. LIBBERT, E.
Einfluss der Trijodbenzoesäure (TIBA) auf die Wirkstoffleitung im Pflanzenstengel. (**The effect of triiodobenzoic acid on the translocation of growth substances in the plant stem.**)
Naturwissenschaften, 1958, **45**: 20, bibl. 3.

Inhibitory effects found in pea plants.

3160. PASTAC, I. A.
Les gibberellines. (Bilan du passé—prévisions pour l'avenir.) (**Gibberellins: a review of the past, and prospects for the future.**)
Reprinted from *Rev. Mycol.*, 1959, **24**: 139-60, bibl. 29.
Les gibberellines. (**Gibberellins.**)
Reprinted from *C.R. XXXI^e Congr. int. Chim. industr.*, Liège, 1958, pp. 3, bibl. 6.

The nature of gibberellins and their chemistry are discussed. They are the only known growth substances which enhance negative geotropic responses of plants without affecting the roots, and they reduce the effects of root-inducing growth substances, although there is no direct antagonism between the 2 groups of substances. The interactions of girth-increasing growth substances with these other groups have not yet been clarified. The activity of gibberellins may be assessed by the simple method of spraying castor bean seedlings, which have just produced their first pair of foliage leaves, and comparing the elongation of the first internode in treated and untreated seedlings. The responses of vegetables, ornamental plants and vines are summarized in the first article, and in the second reference is made to the inhibiting action of foliar nutrition and the stimulating action of tryptophan on the responses of plants to gibberellin. In general, concentrations of less than 1 : 60,000 are nearly or completely ineffective. For general practical purposes the author recommends a 1 : 50,000 solution, which remains active in the plant or in storage for 2 weeks. Stronger solutions can be stored over longer periods, but after 18 months (or probably less) the nature of the substance is so greatly changed that it acts as a growth inhibitor. The main possibility for the practical application of gibberellin in the future appears to lie in the acceleration of seed production, so that plants which are normally biennial would seed in their first year.

3161. CATHEY, H. M.
Gibberellins in horticulture: a preliminary review.
Nat. hort. Mag., 1959, **38**: 215-31, bibl. 71, illus.
3162. KNAPP, R.
Die Gibberelline und ihre Bedeutung für die Pflanzenphysiologie. (**The gibberellins and their significance for plant physiology.**)
Naturwissenschaften, 1958, **45**: 408-13, bibl. 116.
A review.
3163. BRIAN, P. W.
Morphogenetic effects of the gibberellins.
J. Linn. Soc. (Bot.), 1959, **56**: 237-48, bibl. 85.
A review.
3164. STANT, M. Y.
Some growth responses to gibberellic acid.
J. Linn. Soc. (Bot.), 1959, **56**: 249-50.
Observations are recorded on the effects of 100 p.p.m. of GA on *Hibiscus cannabinus*, *Corchorus olitorius*, *Cannabis sativa* and *Zebrina pendula*. All the plants showed increases in height, internode number and internode length. Changes in leaf shape, petiole length, axillary shoot length and numbers of flowers and fruits are recorded for some of the plants.—Roy. bot. Gdns, Kew.
3165. BÜNSOW, R., AND SEIFERTH, C.
Förderung der Samenkeimung durch Gibberellin in Abhängigkeit vom Reifezustand. (**The stimulation of seed germination by gibberellin in relation to seed maturity.**)
Naturwissenschaften, 1959, **46**: 153-4, bibl. 3.
In experiments with seeds of *Kalanchoe blossfeldiana* that had been stored at room temperature for several years, it was found that GA (10^{-3} molar solution) increased both the speed and percentage of germination.—PflPhysiol. Inst. Univ. Göttingen.
3166. DOSTÁL, R.
Gibberellic acid and growth correlations.
Nature, 1959, **183**: 1338, bibl. 7.
Über die Wechselwirkung der Gibberellinsäure und anderer Stimulatoren in den Wachstumskorrelationen. (**The interaction of gibberellic acid and other growth stimulants in growth correlations.**) [Czech and Russian summaries $\frac{1}{2}$ p. each.]
Biol. Plant., Prague, 1960, **2**: 48-60, bibl. 21, illus.
In certain plants the inhibiting effect of growth substances in the leaves was reduced, and the growth promoting effect of the roots was substituted, by treatment with GA.—Tech. Univ., Brno.
3167. SPINA, P.
Prove di efficacia sull'arancio amaro, sulla vite e sul fico. (**Experiments with gibberellins. Tests of effectiveness on sour orange, vine and fig.**) [French summary $\frac{1}{2}$ p.]
Frutticoltura, 1960, **22**: 27-34, bibl. 22, illus.
Young sour orange plants treated with GA at 50 p.p.m., 3 times at 10-day intervals, were temporarily stimulated to grow faster than the untreated controls, but by 30 days after the last treatment there was no difference between the 2 groups. Vines of 4 varieties were sprayed with GA at 5, 20 and 50 p.p.m. on the foliage and inflorescences 3 days after flower opening. There were no significant effects on yield, refractive index or size of fruit. Certain of the fruiting branches of fig trees (var. Bifero bianco) were sprayed with GA at 20, 50 and 100 p.p.m., 1 month before harvesting. Treatment on 7 August markedly increased fruit set, but the percentage of fruit failing to ripen was high. Treatment on the following day, however, had negative results. In future experiments with figs more than 1 treatment will be given.
3168. JUNG, J., AND PFAFF, C.
Über Gibberellin-Säure. (**Gibberellic acid.**)
Z. PflErnähr. Düng., 1958, **81**: 133-41, bibl. 27, illus.
Treatment with GA failed to enhance yields of several vegetables, tobacco and some other plants.
3169. WITTWER, S. H., AND OTHERS.
Gibberellin modifications of photoperiod controlled growth in herbaceous plants.
Naturwissenschaften, 1959, **46**: 117-18, bibl. 7.
The results of several greenhouse experiments show (a) that when plants were exposed to short photoperiods an effect on vegetative extension growth equivalent to, or greater than, that from exposure to a long photoperiod was induced with GA, and (b) that the most pronounced increases in height occurred when GA was applied to plants exposed to short days, although significant increases usually also occurred under long days. As an exception to the latter, tall peas showed little if any height response to GA if grown under long days, but a marked response in short days. A partial or complete replacement of the effects of long days by GA also occurred in dry matter accumulation by plants subjected to a 9-11-hour photoperiod.—Mich. St. Univ., East Lansing.
3170. BRIAN, P. W., AND HEMMING, H. G.
Effects of gibberellic acid, cobalt and acetate on growth of pea stem sections.
Naturwissenschaften, 1957, **44**: 593-4, bibl. 7.
In respect of the extension of pea stem sections the effects of GA and acetate were found to be additive, whereas those of Co^{++} and acetate were usually

less than additive.—Akers Res. Labs, I.C.I. Ltd., Welwyn.

3171. ASHTON, F. M.

Effect of gibberellic acid on absorption, translocation and degradation of 2,4-D in red kidney bean.

Weeds, N. York, 1959, 7: 436-41, bibl. 8.

Kidney beans (*Phaseolus vulgaris*) with the first trifoliate leaf unfolding were sprayed with a 100 p.p.m. aqueous solution of GA (potassium salt) 48 hours prior to the application, to one primary leaf, of 10 µg. of 2,4-D labelled with C¹⁴ in the carboxyl group. The 2,4-D in the untreated areas of the plants was estimated quantitatively (1) at intervals during the first 24 hours, (2) at intervals over 10 days, the treated leaves being removed after the first 24 hours, and (3) 1, 3, 5 and 10 days after application. The experiments were repeated but with the omission of the GA treatment. The results showed: (1) the rate of absorption and translocation of 2,4-D during the first 24 hours was unaffected by GA, (2) the rate of degradation of 2,4-D over 10 days was unaffected by GA, and (3) the decrease in 2,4-D content after 3 and 5 days was much less in the plants treated with GA than in the untreated, but it was level after 10 days. It was, therefore, concluded that the higher content of 2,4-D resulted from increased translocation. [For earlier work see *H.A.*, 29: 52.]—Univ. Calif., Davis.—*Weed Abstr.*, 9, No. 173.

3172. ČAJLAHJAN, M. H., AND HLOPENKOVA, L. P.
The influence of auxins and vitamins on the growth and development of gibberellin-treated plants. [Russian.]

Doklady Akad. Nauk S.S.S.R., 1959, 129: 454-7, bibl. 6, illus.

Under short-day conditions the growth of *Perilla nankinensis*, a short-day plant, was stimulated by GA, unaffected by vitamins B and C, and retarded by heteroauxin and NAA. When the auxins and vitamins were applied together with GA, the vitamins produced the tallest plants, heteroauxin intermediate and NAA the shortest. The growth pattern of non-flowering perilla plants in long days was similar. In *Rudbeckia bicolor*, a long-day plant, GA induced flowering and the combined treatments induced stem elongation under short-day conditions. In long days the effects of the treatments were similar to those produced in perilla.

3173. LANG, A.

Gibberellin-like substances in photoinduced and vegetative *Hyoscyamus* plants.

Planta, 1960, 54: 498-504, bibl. 18.

Gibberellin-like activity in *Hyoscyamus niger* plants has been obtained only from the younger leaves or from the younger leaves plus shoot tips. There were quantitative and/or qualitative differences

between the gibberellins of vegetative and of photoperiodically-induced plants.—Calif. Inst. Technol., Pasadena.

3174. MACMILLAN, J., AND SUTER, P. J.

The occurrence of gibberellin A₁ in higher plants: Isolation from the seed of runner bean (*Phaseolus multiflorus*).

Naturwissenschaften, 1958, 45: 46, bibl. 12.

The occurrence of gibberellin A₁ in beans (and probably in other species) "leaves little doubt that at least gibberellin A₁ participates directly in the growth regulating system of higher plants". [For note on occurrence of gibberellin A₅, see *H.A.*, 30: 72.]—Akers Res. Labs, I.C.I. Ltd., Welwyn.

3175. BÜNSOW, R., PENNER, J., AND HARDER, R.
Blütenbildung bei *Bryophyllum* durch Ex-trakt aus Bohnensamen. (Flower formation in *Bryophyllum* following the application of extracts from bean seeds.)

Naturwissenschaften, 1958, 45: 46-7, bibl. 9, illus.

Bean seed extracts, shown by Macmillan and Suter [preceding abstract] to contain gibberellin, were found to induce flower formation in short-day plants of *Bryophyllum crenatum*. It is suggested that gibberellins play an important part in natural flower formation and that a connection exists between this compound and the long-sought flowering hormone.—PflPhysiol. Inst., Univ. Göttingen.

Experimental and statistical techniques.

(See also 3359, 3437, 3960, 3995, 3996, 3998, 3999, 4027, 4050, 4110, 4114, 4117, 4274, 4316, 4364, 4365, 4390, 4610.)

3176. STUBBE, H.

Einige Ergebnisse der Mutationsforschung an Kulturpflanzen. (Some results of mutation research in cultivated plants.)

SitzBer. dtsh. Akad. Wissensch. Berlin, Klasse für Medizin Jahrg. 1959, No. 1, pp. 32, bibl. 67, illus., from Akademie-Verlag, Berlin W.1, DM 2.20.

The author, who notes that the essential aim of the Institute for Research in Cultivated Plants at Gatersleben is to determine fundamental facts, discusses in this article several examples in which the facts discovered have led to practical results. Among crops in which mutations have been induced by irradiation at Gatersleben are tomatoes, with resulting changes in alkaloid contents, and the apple varieties Weisser Klarapfel, James Grieve, Ontario and Gravenstein. Work on apples started in 1954, and so far the result of treatment is not entirely clear in the progeny except in the case of Weisser Klarapfel, where the desired red colour has been found in some of the mutants. A third plant, in which breeding following mutation

induction has achieved outstanding success, is the garden snapdragon, *Antirrhinum majus*, where a plant showing a single-stem habit has been evolved by hybridization with a mutant form of *A. eremosa*.

3177. FENSOM, D. S.

A note on electrical resistance measurements in *Acer saccharum*.

Canad. J. Bot., 1960, **38**: 263-5, bibl. 3.

A technique for physiological studies using insulated silver nails.

3178. BARSKIJ, I. JA, AND BARDINSKAJA, M. S.

The use of ultra-violet fluorescence microscopy in the study of the lignification of cell walls. [Russian.]

Doklady Akad. Nauk S.S.S.R., 1959, **129**: 443-6, bibl. 19, illus.

As applied to carrot callus tissue.

3179. ILJIN, V. S.

Método del hipbromito para la determinación de nitrógeno en las plantas. (The hypobromite method for determination of nitrogen in plants.)

Agron. trop. Maracay, 1958, **7**: 191-205, bibl. 8.

Preceded by wet combustion with concentrated sulphuric acid.

3180. NIEMANN, A.

Zur Bestimmung des Glutamins und Asparagins in Pflanzensäften. (The determination of glutamine and asparagine in plant saps.)

Naturwissenschaften, 1958, **45**: 12, bibl. 9.

3181. IBRAHIM, R. K., AND TOWERS, G. H. N.

The identification by chromatography of plant phenolic acids.

Arch. Biochem. Biophys., 1960, **87**: 125-8, bibl. 9.

A method is described for the separation and identification by two-directional paper chromatography of 21 phenolic acids, many of which are known to occur in various species of higher plants. A brief survey of species indicates that the distribution of some of these compounds is much more extensive than has been supposed.—McGill Univ., Montreal.

3182. HARDON, H. J., BRUNINK, H., AND VAN DER POL, E. W.

The determination of 1-naphthyl methyl-carbamate (Sevin) residues in apples.

Analyst, 1960, **85**: 187-9, bibl. 3.

3183. BAKER, E. A., AND SKERRETT, E. J.

The determination of dieldrin.

Analyst, 1960, **85**: 184-7, bibl. 6.

3184. PEARCE, S. C.

A method of studying manner of growth.

Biometrics, 1960, **16**: 1-6.

In a group of developing organisms the relationship between such quantities as the standard error of $\log$ (size) and the mean increment in $\log$ (size) will sometimes suggest a law of growth. This is illustrated by some results with apple trees. [Author's summary.]—E. Malling Res. Stat., Kent.

3185. PEARCE, S. C., AND BROWN, A. H. F.

Improving fruit tree experiments by a preliminary study of the trees.

J. hort. Sci., 1960, **35**: 56-65, bibl. 6.

In this paper data are examined from two apple trials and one pear trial over periods of 25-30 years to determine what measurements of previous performance, whether of trunk girth or of cropping, would be most closely associated with the crops of an experiment started after the trees have already become established. With apples and pears the crop in the two years preceding the start of an experiment and the trunk girth at its start may both be effective. Usually, however, if one is effective the other is not; hence the method of double covariance is suggested for making the necessary adjustments. When this is done the error variance may be halved. Studies of other means of using past crop records for this purpose are discussed.—E. Malling Res. Stat., Kent.

3186. NELDER, J. A., AND OTHERS.

An approach to the study of yearly and other variation in crop yields.

J. hort. Sci., 1960, **35**: 73-82, bibl. 19.

Difficulties in the interpretation of long-term field experiments caused by the large year-to-year variation in crop yields are discussed, and previous work on the subject is reviewed. The idea is put forward of replacing chronological time in the growth equations of vegetative crops by a time scale based on some suitable combination of meteorological factors. The theory is developed first for unrestricted (exponential) growth in a regular environment, and then extended to restricted growth, using a generalized form of the logistic equation as the basic growth curve. Complications caused by non-additive effects in an irregular (field) environment are discussed, particularly those of the type which produce reversible checks to growth. Applications of the model are suggested for the interpretation of treatment $\times$ year and treatment $\times$ site interactions and for the investigation of reversible checks. The present model used is compared with others previously proposed for growth analysis, and the view is put forward that repeatability of results is the only sound basis for judging the value of such models. A possible extension to growth components is

envisaged. [Authors' summary.]—Nat. Veg. Res. Stat., Wellesbourne, Warwick.

3187. ARNOLD, C. Y.

The determination and significance of the base temperature in a linear heat unit system.
Proc. Amer. Soc. hort. Sci., 1959, **74**: 430-45, bibl. 18.

The nature of the error introduced into a linear heat unit system [for determining temperature sums] by the use of an incorrect base temperature is generalized by saying that when the selected base is too high heat unit summations will increase as the mean temperature during the developmental period increases, and that if the selected base is too low the reverse trend will take place. The base temperature resulting in the lowest coefficient of variation of heat unit summations, rather than the one resulting in the lowest standard deviation, is shown to be the appropriate one. The base temperature resulting in a zero regression coefficient in an equation relating mean temperature to heat unit summations is shown to agree closely with that giving the lowest coefficient of variation of heat unit summations. A new method is presented which uses a regression equation between temperature and the rate of development. The equation is solved for the temperature when the rate of development is zero in order to obtain the base temperature. Its advantage over previous methods is that it eliminates the necessity of recalculating the heat unit summations on a series of base temperatures. Results from this method agree with those obtained with the coefficient of variation method. A review of the literature reveals little evidence of the true shape of the temperature-rate curve under field conditions. The fact that it is probably curvilinear even within the range of temperature encountered in the field has two important implications concerning the base temperature calculated by the methods described. First, it will vary with the range of temperatures in the data from which the calculations are made, and second, it need not coincide with maximum temperature which will permit plant development. It is concluded that base temperatures that are too high have frequently been used. [Author's summary.]—Univ. Ill., Urbana.

Practical and research equipment.

(See also 3371, 3372, 3617-3619, 3635-3637, 3673, 3725, 3957, 4072, 4080, 4088, 4089, 4105, 4106, 4182, 4185, 4316, 4347, 4493, 4499, 4548, 4555, 4605, 4619, 4622, 4630.)

3188. BODMER, H.

La culture des plantes horticoles en plaques "Multipot". (The culture of horticultural plants in Multipots.)
Rev. hort. suisse, 1960, **33**: 99-101, illus.

Excellent growth and a considerable saving in labour has resulted from the use of Multipots as containers for pricking out or for rooting small cuttings. A Multipot is a plastic sheet with 24, 54 or 100 pot-shaped indentations, somewhat resembling an egg-packing carton [see *H.A.*, 30: 1576].

3189. GLINIECKI, V. L.

Evaluating polyethylene films for agriculture.
Down to Earth, 1959, **15**(3): 7-9, bibl. 4.

Several types of polythene film were tested for weather resistance, soil temperature beneath the film, moisture conservation, weed control and gas permeability. The black films were the most durable; gas permeability was related to thickness rather than to colouring.

3190. GOODE, J. E., AND HYRYCZ, K. J.

The soil moisture tensiometer: its practical value for field use in fruit crops and its construction.

A.R. E. Malling Res. Stat. 1959, 1960, **A43**: 78-84, bibl. 22, illus.

The advantages of making soil moisture measurements directly in the root zone of a crop are discussed, and the usefulness of a tensiometer for this purpose is assessed. The construction of a simple, conventional tensiometer is described.

3191. LINDER, R., AND LÖTSCHERT, W.

Eine neue Elektrode zur Bestimmung der physiologisch wirksamen Bodenfeuchtigkeit. (A new electrode for the determination of physiologically active soil moisture.)

Z. Pflernähr. Düng., 1958, **82**: 33-7, bibl. 10, illus.

3192. WALKOF, C.

Note on a plot irrigator.

Canad. J. Plant Sci., 1960, **40**: 209-10, illus.

A description of a device suitable for small plot irrigation studies on vegetables, and capable of delivering water uniformly over the area in precise quantities.—Canada Dep. Agric., Morden exp. Fm, Manitoba.

3193. NATIONAL INSTITUTE OF AGRICULTURAL ENGINEERING.

Report on test of "Micronette" hand-propelled sprayer.

Rep. N.I.A.E. **224**, 1959, pp. 13, bibl. 3, illus.

This simple, easily handled machine was found capable of spraying high, medium and low volume solutions and, with care, low volume suspensions. It produced very small droplets and generally gave a satisfactory deposit. For large trees and thick crops spraying from 2 sides would be desirable. Under glass the machine gave an even deposit, was very manœuvrable, and should be useful with longitudinal rows of crops.

3194. BYASS, J. B., WEAVING, G. S., AND CHARLTON, G. K.

A low-pressure air-blast nozzle and its application to fruit spraying. I. Development of the equipment. [French and German summaries 13 lines each.]

J. agric. Engng Res., 1960, 5: 94-108, bibl. 7, illus.

A nozzle is described which uses a large volume of air within the capacity of a single-stage fan, liquid being introduced through tubes projecting radially into the air duct. Machines employing the nozzle will spray a much wider range of volumes per acre than conventional designs without being more costly or complicated. Associated flow control and other component designs are described, and designs of self-powered and power take-off machines are specified.—N.I.A.E., Silsoe, Beds.

3195. STANILAND, L. N.

Field tests of spraying equipment by means of fluorescent tracer techniques. [French and German summaries 12 lines each.]

J. agric. Engng Res., 1960, 5: 42-82, bibl. 6, illus.

The results are presented of tests on the efficiency of several types of knapsack, concentrate, paint, high-pressure liquid and air-blast sprayers, and of one type of aerial sprayer, under field and glass-house conditions on various crops, including small fruits, apples, tomatoes and flowers including bulbs. Extensive tables and photographs of the intensities and distribution of spray deposits on leaves are included. Great variation in the efficiency of the various types of sprayer was found, the most efficient tested being those employing a large volume of air at a low velocity, having droplets of moderate size and capable of applying not less than 50 gal. per acre. [See also *H.A.*, 29: 2093i.]—N.A.A.S., Bristol.

3196. CALPOUZOS, L., AND OTHERS.

A precision spray technique for evaluating oils for sigatoka disease control on individual banana leaves in the field.

Phytopathology, 1960, 50: 69-72, bibl. 4, illus.

A spray technique for applying precise, small amounts of oil to single leaves of banana plants in the field was developed for the evaluation of oils for sigatoka leaf-spot disease control [see *H.A.*, 29: 2928]. Applications of an oil at 1.16, 1.85, and 3.06 gal./acre produced respective median deposits of 1.6, 2.6, and 4.3 mg./100 cm.² of leaf surface. To reproduce these oil deposits on single leaves, a spray arrangement used an artist's air-brush connected to a tank of compressed air equipped with a reducing valve. The spray air was delivered to the air-brush by a pipette inserted in the fluid intake. Spray rates were accurate to the nearest 0.01 ml., and the average particle diameter was 48 μ . The oil was directed to the

leaf tissue by a cloth-covered shield. The oil deposit on the sprayed area was reproducible. [Authors' summary.]—A.R.S., U.S.D.A., Mayaguez, P.R.

3197. YEO, D., MCKINLAY, K. S., AND MCKONE, C. E.

Relationships between physical and biological assessments of the performance of a spraying machine against coffee leaf miner, *Leucoptera mayricki*.

Misc. Rep. colon. Pesticides Res. Unit Arusha 254, [1959], pp. 8.

The results of trials with an Autoblast air-assisted hydraulic sprayer indicate, in general, that the kill of a static pest in any site is determined not only by the mean deposit but also by its distribution, and also that very probably the physical assessments of a machine's performance in a crop combined with laboratory bio-assays of insecticides against the given pest may give a fair estimate of the machine's performance in the field.

3198. BATYUK, V. P., RYBALKO, E. F., AND OKANENKO, A. S.

A photoelectric planimeter for measuring leaf area. [Czech and Russian summaries $\frac{1}{4}$ p. each.]

Biol. Plant. Prague, 1959, 1: 167-75, bibl. 7, illus.

The two-channel photoelectric planimeter described is based on the absorption of rays within the wave-length range of 0.6 to 1.4 μ . The flux of radiation is converted to electric signals by silver sulphide photocells. The difference in the photoelectric currents from the measuring and control channels is amplified by a sensitive and highly stable d.c. differential amplifier and is indicated by a meter which can be calibrated direct in area units. [From authors' summary.]—Ukrainian Res. Inst. Plant Physiol., Kiev.

3199. KATTAN, A. A.

A new firmness meter.

Ark. Fm Res., 1959, 8(5): 6, illus.

A modification of the Firm-O-Meter [see *H.A.*, 28: 1534] for use with peaches, tomatoes, cucumbers and apples.

3200. FRIEND, M. T.

Shade measurement by a chemical radiation meter.

E. Afr. agric. J., 1959, 25: 110-12, bibl. 1.

A pilot field trial was made of a simple light meter consisting of a solution of anthracene in benzene [see *H.A.*, 28: 3283]. Measurement of the light intensity in a plot of tea bushes shaded by 40 ft high *Grevillea robusta* trees has shown that the method could be useful in lightly shaded areas.—E. Afr. Agric. For. Res. Org., Kikuyu, Kenya.

3201. ZAHN, G., AND FRIEDRICH, T.
Ein Lichtthermostat mit Luftfeuchtigkeitsregelung. (A light thermostat capable of regulating the humidity of the air.)

Z. PflKrankh., 1960, 67: 154-7, bibl. 5, illus.

The light thermostat described permits the regulation of both temperature and relative humidity subject to certain restrictions imposed by the temperature and humidity of the surrounding air. The range of the regulating capacity can be extended by placing the apparatus in a cool room and by drying the air. If there are any transpiring plants in the chamber, it is not necessary to increase the humidity.—Inst. Phytopath., Aschersleben.

3202. BOSIAN, G.

Zum Problem des Küvettenklimas: Temperatur und Feuchteregulierung. (The climate of growth chambers: the regulation of temperature and humidity.)

Reprinted from *Ber. dtsh. bot. Ges.*, 1959, 72: 391-7, bibl. 9, illus.

For studying the gas exchange of plants in growth chambers under simulated field conditions.

3203. IRGENS-MOLLER, H.

Automatic control of photoperiod.

Ecology, 1960, 41: 222-3, illus.

The apparatus described consists of a battery of wooden growth chambers lined with aluminium foil, which can be opened to give natural illumination of 200 f.c. at noon, or closed for artificial illumination at the same intensity from fluorescent lamps. The chambers also contain blackened incandescent lamps for heat control, which are actuated by the same time switch mechanism that works the illumination.—Ore. St. Coll., Corvallis.

3204. OWEN, F. W.

A new aid for the teaching of pruning.

Proc. Amer. Soc. hort. Sci., 1959, 74: 101-5, illus.

For classroom demonstration and practice in pruning, a "gimmick" tree has proved very convenient. The tree should be cut when dormant and the branches cut and labelled at all possible pruning points. To enable the tree to be repeatedly dismantled and reassembled, the cut branches are fitted with steel pegs or plugs and corresponding holes are drilled to fit them.—Univ. Ill., Urbana.

3205. TWERSKY, M., CARMON, J. L., AND HILLSMAN, G. A.

Recording results "on-the-spot" using manual punch card equipment.

Agron. J., 1960, 52: 121-2, illus.

A portable punching device for recording data on cards has been tested in the laboratory and greenhouse. This device, named Port-A-Punch, eliminates the preliminary writing or typing of a source document for the ordinary IBM punch card prepara-

tion. Predesigned cards for Port-A-Punch offer an easy, rapid means of recording information "on-the-spot".—A.R.S., U.S.D.A., Watkinsville, Ga.

Greenhouses and frames.

(See also 3901, 4622.)

3206. CHALLENGER, S.

Glasshouse materials. Evaluation of plastic preparations.

N.Z. Gdnr., 1959, 16: 237, 239, 241.

The plastics discussed include polythene, PVC, cellulose acetate, Kodapak, Linapol, Mylar and Melinex. All of these allow a greater heat loss than glass, but polythene may be improved in this respect if it is covered with a film of water. Light transmission by all types is good. The cost and durability of these materials are considered. [See also *H.A.*, 30: 1598.]

3207. SHELDRAKE, R.

Plastic film progress.

Bull. N.Y. St. Flower Grs., 1959, No. 167, pp. 1-2, illus.

Cellulose acetate butyrate and Mylar 200 A films lasted for more than 24 months on the south side of a greenhouse, this being more than twice the life of polythene under the same conditions. The vinyl and butyrate materials tested became brittle on exposure to -40° F., especially following exposure to summer sunshine. Mylar, however, survived the cold test. Thin fibre-glass films are now under trial and appear promising.

3208. GRAY, H. E.

Plastics play important role in up-to-date greenhouseing.

Flor. Exch., 1959, 133(23): 70, 80-1.

With the present plastic materials, which require frequent renewal, greenhouse design should make this operation as simple as possible. An aluminium house of semi-circular design is described, in which the plastic covering material is held in place by a cable which lies in a groove and is secured at each end of the house. The properties of polythene, polyvinyl and polyester plastics in relation to greenhouse use are discussed.

3209. MĂNESCU, B., DUMITRESCU, M., AND MAIER, L.

Folosirea maselor plastice in constructiile de sere (II). (Plastic materials for greenhouses. II.) [English, French, German and Russian summaries $\frac{1}{2}$ p. each.]

Grăd. Via Liv., 1960, No. 1, pp. 7-16 + summaries, illus.

The advantages claimed for the use of polythene film in place of glass for growing tomatoes, cucumbers and pinks were: reduction in the amount of framework required, 30-35% increase in light

transmitted, 30% reduction in the cost of fuel, 20% increase in crop yield and 12% reduction in growing period. Different cultural methods, however, were required from those found effective under glass.

3210. CASINI, E.

Nuovi tipi di serre economiche. (New inexpensive types of greenhouse.)

Frutticoltura, 1960, 22: 22-6, illus.

Plastic and glass combined with plastic shown in annotated photographs.

3211. SHERRIFF, A. W.

Four years with mobiles. Part 1. The practical approach. Part 2. Greater yields. *Comm. Gr.*, 1960, No. 3343, p. 230, and No. 3345, p. 343.

An account of an Essex grower's method of using mobile glasshouses for a 3-year rotation with 2 spring lettuce crops followed by tomatoes and then October chrysanthemums.

3212. MORRIS, L. G.

Principles of glasshouse heating.

Agriculture, Lond., 1959, 66: 403-7.

The problems of heating glasshouses are discussed, and the efficiency of systems employing natural circulation of hot water in 4-in. pipes is compared with the use of narrower pipes and steam heating. Recent methods of heating the air directly are described. The simplest method is an automatically-fired air heater unit in the glasshouse, the heated air being passed through 8-in. polythene ducts kept inflated by the pressure of the hot air.—N.I.A.E., Silsoe, Beds.

3213. REINHOLD, J., AND OTHERS.

Spezielle Erfahrungen mit der Umluftheizung im Gemüsebau. (Observations on the air circulation method of glasshouse heating in vegetable growing.)

Dtsch. Gartenb., 1960, 7: 10-13, bibl. 6.

A method of glasshouse heating by air circulation that has proved as effective as hot-water heating for cucumbers and tomatoes.—*Inst. Gartenb., Grossbeeren, and VEG Gemüsekomb., Wollup.*

3214. WHITTLE, R. M., AND LAWRENCE, W. J. C.

The climatology of glasshouses. II. Ventilation. [French and German summaries 6 lines each.]

J. agric. Engng Res., 1960, 5: 36-41, bibl. 2.

Ventilation rates were measured using the tracer gas technique. The mean air change rate in unventilated plant and propagation houses was between 1 and 2 per hour when the mean wind velocity was about 7 m.p.h., whereas full roof and side ventilation gave over 40 changes per hour. In a small test house, increasing the area of the roof ventilators did not increase the air change rate proportionally unless the floor level ventilators

were of comparable area. Measurements made in a typical plant breeding cubicle situated on one side of the central corridor of a house suggested that ventilation was inadequate. Automatic operation of the roof and probably also of other ventilators promises to give more efficient air temperature regulation than manual control. [For Part I, see *H.A.*, 30: 1593.]—John Innes hort. Instn, Bayfordbury, Herts.

3215. CARPENTER, W. J., AND WILLIS, W. W.

Comparisons of evaporative fan-and-pad and high pressure mist systems for greenhouse cooling.

Proc. Amer. Soc. hort. Sci., 1959, 74: 711-18, bibl. 8, illus.

Several evaporative cooling systems, including high pressure mist and burlap with fans, aspen excelsior padding and exhaust fans, and a combination of these with exhaust fans were found to be effective in reducing greenhouse temperatures 3° to 5° F. below prevailing outside official temperatures and 8° to 11° F. below normal greenhouse temperatures. These temperature differences occurred without shading on the glass in the cooled greenhouses and with light intensities reduced to 5,000 to 6,000 f.c. in the uncooled greenhouse. Official outside relative humidities averaged more than 50% even when daily temperatures exceeded 90° F. Greenhouse temperatures in the sections cooled by the high pressure mist systems were lower statistically than those in the fan-and-pad cooled section at 2 p.m. and 4 p.m. when daily maximum temperatures exceeded 80° F. No significant difference was found at other hours and at lower temperatures. There were no consistent differences in temperatures between the high pressure mist and burlap system and the high pressure mist and aspen pad system. The results of the tests for significance left little doubt of the quadratic effect of outside temperature on inside temperature for the cooled greenhouse sections. In the uncooled greenhouse there was only slight evidence that a quadratic effect existed. The cooled greenhouses had significantly higher humidities than the uncooled section. The humidities in the mist cooled sections were significantly higher than those in the fan-and-pad cooled greenhouse. No consistent differences were found between the two high pressure mist systems. [Authors' summary. For earlier work, see *H.A.*, 28: 1678.]—*Kans. agric. Exp. Stat., Manhattan.*

3216. LEACH, A. D., JR.

A study of greenhouse cooling.

Diss. Abstr., 1959, 20: 1920-1, being *L.C. Card No. Mic.* 59-6138 of 127 pp.

Of 8 methods of cooling studied, the fan-and-pad system was the most effective for reducing summer

air temperatures in a greenhouse. [See also *H.A.*, 29: 3202.]

3217. CORDELL, E. C.

The pros and cons of cropping systems under glass.

Comm. Gr., 1960, No. 3356, pp. 1051-3.

Alternate block, alternate frame, full block and combined frame and structure systems briefly discussed.

3218. WILL, H.

Temperaturen im Wanderkasten. (Temperatures in mobile frames.)

Rhein. Mschr. Obstb., 1959, 47: 176-8, from abstr. in *InformDienst Weihenstephan*, 1959, No. 11, p. 168.

A single-span frame registered the highest temperatures when in the East-West position, and a double-span frame when in the North-South position. Covering the lights with straw mats increased the temperature of the frames at night by $1\frac{1}{2}$ – $2\frac{1}{2}$ ° C.

3219. WILL, H.

Temperaturen im Frühbeetkasten. (Temperatures in hot frames.)

Rhein. Mschr. Obstb., 1959, 47: 153-4, from abstr. in *InformDienst Weihenstephan*, 1959, No. 11, p. 168.

Double-span frames had higher soil temperatures and a more uniform temperature curve than single-span frames.

Packing, storage and marketing.

(See also 3378-3380, 3424, 3436, 3870.)

3220. GREEN, N. K.

Design of horticultural packing-sheds.

Agriculture, Lond., 1960, 66: 459-62.

Governing principles, points in construction and sources of further information.

3221. JONES, A. H., DESMARAIS, J. G., AND WINFIELD, K. E.

How efficient are fungicidal paints?

Canad. Paint and Varnish Mag., May 1956, reprinted in *Coll. Paps Canad. Cttee Food Pres.* 1953-1958, Vol. 6, pp. 8, bibl. 8, illus.

The ability of 16 fungicidal paints on the Canadian market to prevent the development of micro-organisms on storage room walls and other surfaces is reported. Paints containing di-(phenyl mercury) dodeceny succinate were superior to either chlorinated rubber base paints or to paints containing copper-8-quinolinolate [see also *H.A.*, 26: 249]. Paints to which other mercury salts such as naphthenate had been added were also excellent. When used in storage rooms the concentration of fungicide in the paint was important, especially at high temperatures. At 32° F. 0.1% succinate effectively controlled fungi, but at

65° F. it did not; 0.25% succinate was equally effective at 37° and 65° F. The type of paint also had an important influence on the efficiency of the added fungicide.

3222. F.A.O.

Report of the European meeting on the use of ionizing radiations for food preservation, Harwell, 1958.

FAO, Rome, 1959, pp. 34.

A summary of the proceedings and conclusions, including a list of the papers presented. Topics discussed included the effects of radiation on fresh fruit and vegetables and on the various constituents of food. Individual papers are being published elsewhere.

3223. SALUNKHE, D. K., POLLARD, L. H., AND GERBER, R. K.

Effects of gamma radiation dose, rate and temperature on the taste preference and storage life of certain fruits, vegetables and their products.

Proc. Amer. Soc. hort. Sci., 1959, 74: 414-22, bibl. 4, illus.

Ripe Bartlett pears could stand only small doses of radiation without browning and deterioration of flavour, but mature green pears could withstand moderate doses (up to 2.5×10^5 rads). Strawberries and tomatoes were too sensitive to radiation effects to allow satisfactory treatment. In asparagus, runner beans and cabbages irradiation caused development of off-flavour at first, but this declined after 10 days' storage at 50° F. High temperatures (over 100° F.) during radiation caused shrivelling and desiccation of fruits and vegetables. Pre-radiation dips of DHA-S (fungicide), myprozine (anti-fungal antibiotic) or sorbic acid (fungistatic) showed some promise for control of moulds. Mould growth was suppressed by gamma radiation (over 2.5×10^5 rads) on many products.—Utah St. Univ., Logan.

3224. SALUNKHE, D. K., GERBER, R. K., AND POLLARD, L. H.

Physiological and chemical effects of gamma radiation on certain fruits, vegetables, and their products.

Proc. Amer. Soc. hort. Sci., 1959, 74: 423-9, bibl. 10.

Tomatoes and strawberries appeared to be crops too sensitive for gamma radiation. The ripening processes of green tomatoes were slowed down by radiation, the threshold value for satisfactory treatment being about 1.86×10^5 rads. At higher doses red colour formation was retarded. Anthocyanin and lycopene pigments appeared to be much more susceptible to degradation by radiation than did carotenoid and chlorophyll pigments. Carbon dioxide production by fruits and vegetables in cans was inversely proportional

to the dose of radiation, but oxygen uptake was directly proportional to the dose of radiation. A fast rate of radiation (0.93×10^6 rads/hour) tenderized asparagus much more effectively than slow or intermediate rates, even at low doses. At low doses a fast rate of radiation accelerated the rate of degradation of ascorbic acid in strawberries more than did a slow rate, but at high doses there was no difference in ascorbic acid content between the two rates of radiation. [See also *H.A.*, 29: 2436.]—Utah St. Univ., Logan.

3225. F.A.O.

Marketing fruit and vegetables.

FAO Mktg Guide 2, 1957, 9 × 6 in., pp. 205, bibl. 39, illus., 10s. or \$2.00.

Methods of handling fruit and vegetables between the producer and consumer with a minimum of wastage and at the lowest possible cost are discussed in 8 chapters under the following headings: general observations; growers' contribution to

marketing; packing, transport and storage; standardization of product and packaging; sales methods; wholesale markets; marketing policy; and organization and services. In the appendices recommendations are given on standardization, quality control and grade specification.

3226. BOGARDUS, R. K., AND BURT, S. W.

Loading out fruits and vegetables in wholesale warehouses.

Mktg Res. Rep. U.S. Dep. Agric. 282, 1959, bibl. 53, illus.

Work studies which show that costs can be reduced by using pallets, fork-lift trucks and belt conveyors.

3227. U.S. DEPARTMENT OF AGRICULTURE.

Grade names used in U.S. standards for farm products.

Agric. Handb. U.S. Dep. Agric. 157, revised 1960, pp. 32.

Including fruits, vegetables, nuts and tobacco.

TEMPERATE TREE FRUITS.

General.

(See also 4610, 4619, 4631, 4635.)

3228. (NEW ZEALAND DEPARTMENT OF AGRICULTURE, HORTICULTURAL DIVISION.)

Official survey of the fruitgrowing industry of New Zealand (1958).

Suppl. to *Orchard. N.Z.*, March, 1960, pp. 28.

Population figures for pome, stone, citrus and some other sub-tropical fruits.

3229. DRAGAVCEV, A. P.

Fruit crops of China. [Russian.]

Priroda, 1959, 48(12): 29-34, illus.

An interesting inventory of the more important of the 120 fruit species cultivated in China [see also *H.A.*, 29: 75].

3230. SMITH, A. W.

County Armagh: a survey of the apple orchards.

Mon. agric. Rep. Minist. Agric. Belfast, 1959, 34: 236-40.

Acreages, varieties and new plantings surveyed for 1957-59.

3231. POWELL, H. R.

The apple industry in Western Australia. Some developments over the last twenty years.

J. Agric. W. Aust., 1959, 8: 503-20, illus., and *Fruit World, Melbourne*, 1959, 60(11): 35-41.

A survey, dealing with acreage, production, export, changes in varieties, the acquisition scheme,

weather cycles, disease eradication, pests, crop losses, rootstocks and investigations.

3232. FAN, S.-C.

The causes of variability of yields, costs, and returns in apple production in Western New York, 1956 and 1957.

Diss. Abstr., 1959, 20: 1917-18, being *L.C. Card No. Mic.* 59-6143 of 222 pp.

3233. FAIVRE, M.

L'abricot dans le Rhône et son verger-pilote. (Apricots in the Rhône district, and the apricot demonstration orchard.)

Pomol. franç., 1959, 1(10): 3-7, illus.

Rootstocks, interstocks, varieties, manuring, cultural practices and spray treatments are described, and yields are quoted for each of the 8 years of production in the demonstration orchard, the average being 15.7 tons/ha.

3234. N.S.W. DEPARTMENT OF AGRICULTURE, DIVISION OF HORTICULTURE.

Cherry growing in New South Wales.

Agric. Gaz. N.S.W., 1959, 70: 426-33, 493-9, illus.

Including soils, varieties, pollination and compatibility, vegetative propagation, planting, pruning, management and harvesting.

3235. HUGARD, J.

Études avant la plantation d'arbres fruitiers. (Factors to be studied before planting fruit trees.)

Progr. agric. vitic., 1960, 153: 15-19, 46-51.

General considerations.

Breeding and varieties.

(See also 3176, 3562, 4604.)

3236. BROOKS, R. M., AND OLMO, H. P.
Register of new fruit and nut varieties.
List 14.

Proc. Amer. Soc. hort. Sci., 1959, **74**:
758-85.

Varieties of sub-tropical and temperate tree fruits,
small fruits and nuts described.

3237. TOMCSÁNYI, P.
Vorschläge zur Sortenprüfung bei Obst-
bäumen. (**Suggestions for testing fruit tree**
varieties.) [English and Russian summaries
 $\frac{3}{4}$ p. each.]

Arch. Gartenb., 1959, **7**: 516-46, bibl. 30.

The relatively short testing method recommended
consists of 3 stages, viz. analytical assessment,
exact but indirect tests and supplementary field
trials. Proposals are made for experimental lay-
outs in existing orchards, variety testing, deter-
mining the relative time of maturity and measuring
tree size.—Landesanst. Sortenprüf., Budapest.

3238. BOOGERD, D., AND VAN WELY, A. J. M.
De samenstelling van het sortiment appelen
en peren in 1951-1956. (**The distribution of**
varieties of apples and pears from 1951 to
1956.) [English summary 19 lines.]

Meded. Dir. Tuinb., 1959, **22**: 626-35.

Proportions of summer, autumn and winter
varieties grown in Holland.

3239. LUCE, W. A.
Summer apple varieties in Washington.
Fruit Var. hort. Dig., 1959, **14**: 25.

Lodi, Beacon, Puritan and Tydeman's Early
Worcester show promise.

3240. SÄKÖ, J.
Hedelmänviljelyllä maassamme hyvät edel-
lytykset. (**Good possibilities for fruit growing.**)
[English summary 16 lines.]

Puutarha, 1959, **62**: 529-31, illus.

Finnish experiments on the winter hardness of
apples have shown Sugar Miron and Antonovka
to be hardy rootstocks and Hiberna a good inter-
stock. In laboratory tests cold resistance was high
in Huvitys and Kaneli and low in Lobo and Linda.
The former 2 varieties have been crossed with
Melba to improve quality.

3241. BROWN, D. S., HESSE, C. O., AND KOCH,
E. C.
Reversion of red sports of Delicious apple.
Proc. Amer. Soc. hort. Sci., 1959, **74**: 40-6,
illus.

See *H.A.*, 30: 139.

3242. BISHOP, C. J.
Color sports of apples induced by radiation.
Fruit Var. hort. Dig., 1959, **14**: 37-9, bibl. 8,
illus.

Exposure of dormant scions to 3,000-4,000 r. of
X-rays or to 2-8 hours of thermal neutrons resulted
in a number of dark-red sports of Cortland, in
Golden Russet sports with little russetting and a
reddish colour, but in increased russetting with loss
of colour in Sandow.—Kentville Res. Stat., Nova
Scotia.

3243. SUSZKA, J.
Wstępne wyniki hodowli moreli w Kórniku.
(**Preliminary results of apricot breeding at**
Kornik.) [English and Russian summaries
 $\frac{1}{2}$ p. each.]

Arbor. Kórnickie, 1959, **4**: 227-32, bibl. 6.

A seedling of Sacer was the most frost resistant,
and hybrids of Morela No. 1284 (an Asiatic apricot)
× Moorpark produced the best fruit. Seedlings
of Siewka Kórnicka 7, although hardy and pro-
ducing fruit of good flavour, showed susceptibility
to *Clasterosporium carpophilum*.

3244. BASSO, M., AND NATALI, S.
Contributo allo studio delle cultivar di
ciliegio delle provincia di Pisa. (**A contribu-**
tion to the study of cherry varieties in the
province of Pisa.) [French, English and
German summaries $\frac{1}{4}$ p. each.]

Riv. Ortoflorofruttic. ital., 1959, **43**: 420-48,
508-40, bibl. 37, illus.

Including detailed descriptions of 20 varieties.

3245. TAYLOR, J. W.
Recent developments in nectarines in Cali-
fornia.
Fruit Var. hort. Dig., 1959, **14**: 23-4.

The most important developments are the replace-
ment of white-fleshed by yellow-fleshed varieties
and the introduction of varieties ripening $1\frac{1}{2}$ -5
weeks earlier than Elberta peaches. The most
important varieties grown in California are listed.

3246. OVERCASH, J. P.
Peach research helps growers select varieties.
Miss. Fm Res., 1959, **22**(11): 1, 4, 5, illus.

A table is given in which 37 varieties are classified
according to date of harvest, freeness of stone,
colour of flesh, percentage of soluble solids,
flavour, and suitability for home or commercial
orchards.

3247. PHILLIPS, E. L.
Peach varieties for Virginia.
Circ. Va Polytech. Inst. 763, revised 1959,
pp. 3.

Brief descriptions are given of 7 standard, 8
special-purpose and 8 promising new peach
varieties and of 4 nectarine varieties.

3248. BLASBERG, C. H.
Peach hardness trials in Vermont.
Fruit Var. hort. Dig., 1959, **14**: 25.
Redhaven, Rochester, Oriole, Monroe, NH-E4,

NH-W2 and Meridith were the most frost resistant of the 20 varieties tested.

3249. OBERLE, G. D., MOORE, R. C., AND HARDIGREE, J. B.

Washington, a peach with outstanding frost-escaping ability.

Fruit Var. hort. Dig., 1959, **14**: 26-8, illus.

Vigorous, free-stone and ripens 21 days before Elberta.

3250. (MARTIN, W. H.)

New peach to be named "Collins".

N.J. Agric., 1959, **41**(5): 4, illus.

A yellow-fleshed seedling of Jerseyland $\times$ NJ 188, with fruits free from split pits, ripening in early July several days before Sunrise.

3251. OLDÉN, E. J.

Hybrider mellan europeiska och japanska plommon framställda vid Balsgård. (**Hybrids between European and Japanese plums produced at Balsgård.**) [English summary 1½ pp.]

Sver. pomol. Fören. Årsskr. 1959, 1960, **60**: 67-77, bibl. 13, illus.

Some of the 25 hybrids and their cytology are described.

3252. JOHANSSON, E.

Ariel—en ny plommonsorrt från Alnarp. (**Ariel—a new plum variety from Alnarp.**) [English summary 11 lines.]

Sver. pomol. Fören. Årsskr. 1959, 1960, **60**: 87-90, bibl. 3, illus.

From a cross between Autumn Compôt and Althan's Gage, with fruit of dessert quality that is also good for canning.

Propagation and rootstocks.

(See also 3272, 3317.)

3253. LIMBERK, J.

Možnost vztahů *Agrobacterium rhizogenes* (Riker) k zakořeňování ovocných dřevin. (**The possible relationship between *Agrobacterium rhizogenes* and the rooting of fruit trees.**) [Russian and German summaries.]

Českosl. Biol., 1957, **6**(2): 142-9, bibl. 21, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,474.

On the aerial and under-ground parts of some varieties of apple and quince and the rootstocks M.I, IV and IX small tubercles containing rudimentary roots were found. In these swellings, and especially in the root initials, many bacteria similar to *Agrobacterium rhizogenes* occurred, whose presence was not injurious to the host and which were not transmissible by grafting. The association was defined as metabiosis. It is suggested that the enhanced rooting ability of cuttings carrying such tubercles could be utilized to save a year in propagation; these unrooted cuttings

could be bench-grafted in the winter and, after storage in a cellar, planted out in the spring.

3254. TURECKAJA, R. H., AND KLJUŠKINA, N. S.

Air-layering as a method of propagation. [Russian.]

Fiziol. Rast., 1959, **6**: 721-3, bibl. 7, illus.

Air-layering apples and cherries, using a growth-substance, moss and polythene wrap, was more successful when carried out at the end of June than on 3 other dates. Two to three months after air-layering 8 species of citrus and ornamental shrubs rhododendron alone had failed to produce roots or callus.

3255. POPESCU, M., AND TUȚĂ, V.

Iniințarea livezilor pe nisipurile din regiunea Craiova. (**Establishing orchards on sand by planting rootstocks deeply and grafting in situ.**) (English, French, Russian and German summaries ¾ p. each.)

Grăd. Via Liv., 1959, **8**(9): 46-51 + summaries, illus.

A method of planting seedling rootstocks of apple, quince, pear and *Prunus* spp. in holes 1.2 m. deep is recommended for sandy soils with the water-table at a depth of 4 m. [see also *H.A.*, 30: 1683]. The hole is filled in gradually as growth proceeds, and the rootstock is shield budded when it reaches ground level. All varieties grown in this way rooted strongly and made vigorous growth.

3256. TILLSON, F. W.

Young apple trees adversely affected by PVC budding strips.

J. roy. hort. Soc., 1960, **85**: 93-4.

Budding trials with Granny Smith on M.XVI were carried out in New Zealand, using ties of raffia and 2 different types of PVC (polyvinylchloride). A large percentage of the buds tied with both types of PVC strips failed to grow away normally and, when a bud grew vigorously from a plastic tie, there was always a bend in the shoot just above the union. Raffia ties did not affect the trees adversely.

3257. FRIEDRICH, G.

Weitere Untersuchungen über die Trieb- und Ertragsleistungen einiger Apfelsorten auf verschiedenen *Malus*-Unterlagen. (**Further studies on the rate of growth and yield of several apple varieties on different *Malus* rootstocks.**) [Russian, English and French summaries about 20 lines each.]

Kühn-Arch., 1959, **73**: 1-41, bibl. 10.

Long-term trials are reported, in which various rootstock-scion combinations were compared in several spindle bush orchards in central Germany [for an earlier report, see *H.A.*, 23: 2557]. The data collected over the whole period show that certain varieties, such as James Grieve, Golden Delicious and Ontario, yield well on M.IV, whereas Prinz Albrecht and Geheimrat Oldenburg

are best worked on M.I. The results obtained for Cox's Orange Pippin were not uniform, though under many conditions M.IV produced high yields. Very vigorous varieties, such as Berlepsch and Boskoop, were tested only on M.IX. Growth and yield figures are recorded from the 22-year-old plantation at Naumburg for M.IX, II, IV, V, XI and XVI as well as for some seedling rootstocks in combination with Beauty of Bath, Cox's Orange Pippin, Berlepsch, Boskoop and Ontario. It was found that the more vigorous Malling clones surpassed the seedlings in both rate of growth and yield, Boskoop on M.IV being particularly productive.—Inst. Obst- u. Gemüseb. Martin-Luther-Univ. Halle-Wittenberg.

3258. CARLSON, R. F., AND TUKEY, H. B.
Fourteen-year orchard performance of several apple varieties on East Malling rootstocks in Michigan. (Second report.)
Proc. Amer. Soc. hort. Sci., 1959, **74**: 47-53, bibl. 2.

CARLSON, R. F.
Apples—semi-dwarfs.

Amer. Fruit Gr., 1960, **80**(4): 40, 42, illus.

A report on tree size and precocity was published after the first 5 years of this experiment [see *H.A.*, 20: 1307]. After a further 9 seasons the relative size of the trees remained unchanged, trees on M.XII being the largest, followed closely by those on M.XVI and XIII, and then in descending order by trees on M.II, I, V, IV, and VII. The average annual fruit yield per acre varied according to the scion/rootstock combination. For example, Wealthy on M.XII and M.XVI produced 570 and 471 bushels per acre respectively, Golden Delicious on M.XII 486 bushels, McIntosh on M.II, VII and XIII 414, 448 and 473 bushels respectively, and Northern Spy on M.VII 283 bushels per acre.—*Mich. St. Univ.*, E. Lansing.

3259. ATKINSON, J. D., AND ROBERTS, G. E.
Vigorous apple stocks fail on Otago shingle.
Orchard. N.Z., 1960, **33**: 46-7, illus.

Ten years after planting, Delicious on Northern Spy rootstock had an average trunk circumference of 12.3 cm. on shingle and 25.5 cm. on silt. Corresponding figures for the same variety on M.XVI were 14.9 and 30.4 cm., on M.XII 14.9 and 36.9 cm., on MM.793 15.0 and 31.2 cm., on MM.779 17.0 and 32.3 cm., and on MM.789 15.9 and 34.0 cm. All trees in the silt block were bearing normal crops, but those on the shingle had produced only a few apples.

3260. BABENKO, G. V.
New frost-resistant rootstocks for dwarf apples. [Russian.]
Sadov. Vinograd. i Vinodelie Moldavii, 1957, No. 6, pp. 50-2, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,803.

At the Umansk agricultural institute on a leached loamy chernozem with ground water 10 m. deep, *Malus virginiana*, *M. sargentii*, *M. baccata* and *M. zumi* were the most productive dwarfing stocks. Owing to its high frost resistance *M. zumi* can be used in the central zone of the U.S.S.R., and because of its salt tolerance *M. sargentii* can be used on saline soils. By crossing the salt-tolerant *M. floribunda* (♂) and *M. sargentii* (♀) a new form of salt-resistant rootstock has been obtained.

3261. VAN CAUWENBERGHE, E.

De gedraging van perebomen veredeld op kwee met tussenveredeling. (The performance of pear trees double-worked on quince.)
Belg. Fruit Rev., 1959, **11**: 14-15.

In a trial at Vilvoorde Beurré Hardy and Curé were compared as interstocks for 3 varieties of pear on Quince A rootstock. Average yield figures over a period of 23 years show that Clapp's Favourite was unaffected by the choice of interstock. Triomphe de Vienne yielded better on Curé, whereas Williams' yielded much better on Beurré Hardy.

3262. AHMED, M. B., AND TEWFIK, M.
The development of chlorosis of young Le Conte pear trees as related to the rootstock.

Bull. Cairo Univ. Fac. Agric. **115**, 1957, pp. 13, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 17,250.

Chlorosis resulted in a marked reduction in the growth and development of the whole plant and in reduced leaf production. The chlorotic leaves were characterized by decreased fresh and dry weight, leaf area, moisture and Mn content and by their high content of ash and Fe. Leaves of plants sprayed 3 times during the growing season with a solution containing 1% $MnSO_4$, 0.5% $FeSO_4$ and 0.1% Drefit spreader were very similar to those of normal green plants. The severity of chlorosis on Le Conte pear trees and the percentage of chlorotic trees was shown to be determined by the rootstock used. Trees on *P. calleryana* rootstocks showed the highest percentage of chlorosis, followed by those on *P. communis* and lastly those on quince. [See also *H.A.*, 27: 1245.]

3263. HILDEBRANDT, W.
 Keimungsphysiologische Studien an Steinobst. I. Die Ursachen der Keimruhe von Steinobstsäatgut. (Studies on the physiology of germination in stone fruits. I. The causes of dormancy in stone fruit seeds.) [English and French summaries $\frac{1}{2}$ p. each.]
Gartenbauwiss., 1959, **24**: 161-76, bibl. 80.

A review under the following heads: Introduction; dormancy; methods of pre-treatment for overcoming the dormancy of stone fruit seeds; the heterogeneity of stone fruit seeds.

3264. LIHONOS, F. D.

Some biological characteristics of the seeds and seedlings of fruit trees. [Russian.]

Bot. Žurnal, 1959, 44: 1341-4, bibl. 5.

The temperature and duration of stratification required by fruit tree seeds is considerably affected by their parentage. Seeds of plum and cherry varieties from the north-west of Russia germinated best when stratified at 5° C. for 150 days. Hybrids, in which one or both parents were of southern origin, required higher temperatures and longer periods, i.e., 5-12° C. for 180 days. Seedling size varied with the pollinator.

3265. BLOMMAERT, K. L. J.

New plant hormone replaces stratification of deciduous fruit seed.

Fmg S. Afr., 1960, 35(11): 13-14, illus.

Seedlings of peach, apricot and plum grown from unstratified seed, when given several GA applications at an early stage, developed normally and did not show dwarfing or abnormal leaf growth.—W.P. Fruit Res. Stat., Stellenbosch.

3266. BRÓZIK, S.

Cseresznyefajták magcsemeteiskolai vizsgálata. (Examination of cherry varieties in nurseries.)

Kert. Kut. Int. Évk., 1958, 3: 71-3, from *Hung. agric. Rev.*, 1959, 8, Abstr. 294.

Mainly concerning the germination of seeds of many varieties grown in Hungary.

3267. CAMERON, H. R.

Susceptibility of mazzard seedlings to *Pseudomonas syringae*.

From abstr. in *Phytopathology*, 1960, 50: 82.

In experiments to determine the value of high working cherry varieties on mazzard rootstocks as a protection against bacterial canker, it was shown that mazzard seedlings are tolerant of, but not resistant to, *Pseudomonas syringae*.

3268. ERŠOV, L. A.

Peach rootstocks in the steppe region of the Crimea. [Russian, with English and German summaries.]

Vestn. s.-h. Nauki, 1958, 3(2): 22-32, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,840.

The influence of rootstocks on the growth and productivity of peach in the steppe region of the Crimea. [Russian, with English summary.]

Bjull. nauč. Inf. Gos. Nikitsk. bot. Sad, 1957, No. 5-6, pp. 58-61, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,841.

Under irrigated conditions the compatibility of peach varieties with certain rootstocks was found to be affected by the climate of the region. Growth was most vigorous on peach and apricot. It ceased first on cherry plum, then on almond and

apricot and last on peach. More vigorous root systems were developed on peach and apricot. In the annual growth cycle of the roots 4 periods were distinguished. It was observed that shoot growth was greatest in June following a decline in intensive root growth. Trees grown on apricot were resistant to a temperature of -34° C. On all rootstocks the trees came into bearing in the third year after planting. The highest yields were produced by trees on peach and apricot, which are recommended for the region. It is stated in the second paper that in irrigated commercial orchards average yields of peaches on apricot were 1½-2 times greater than those on almond. [See also *H.A.*, 28: 103.]

3269. ERŠOV, L. A.

The effect of rootstocks on the winter hardiness of peach trees. [Russian, with English summary.]

Bjull. nauč. Inf. Gos. Nikitsk. bot. Sad, 1957, No. 5-6, pp. 62-5, from *Ref. Ž. (Biol.)*, 1958, No. 19, Abstr. 87,233.

In the steppe region of the Crimea the severe winter of 1953-54 killed 36% of the 2-year-old Elberta trees on cherry plum rootstocks, 32% on almond, 25% on peach and 16% on apricot. Among 14-year-old trees those on almond suffered the most, and among 4-year-old trees those on peach.

3270. BLACK, J. D. F.

Pointers from the plum and apricot rootstock trials.

Vict. hort. Dig., reprinted in *Fruit World*, Melbourne, 1959, 60(9): 11.

Of several varieties being tested as rootstocks for Japanese and European plum varieties and for apricots myrobalan stocks have produced the most vigorous trees and generally the highest early yields. Certain varietal differences and exceptions are noted.

3271. JAUHARI, O. S., AND NIGAM, V. N.

A note on air-layering in *Morus alba*.

J. Res. Sci. Agra Univ., 1959, 8(1): 39-42, illus., from *Biol. Abstr.*, Sect. D, 1960, 35, Abstr. 11,491.

A ring of bark about ½ in. wide, ¼ in. below a plump and dormant bud, was removed, and NAA, IAA or IBA in various concentrations were applied on and around the lower bud. The marcots were covered with 1 part compost and 3 parts sand, wrapped and tied, and watered daily, then severed from the parent plant 2 months after the initial treatment. All the treatments induced good rooting, but concentrations of 5,000-10,000 p.p.m. gave better results than higher concentrations. The control did not show any rooting, only callus formation.—Govt agric. Coll., Kanpur.

Climatic factors and air pollution.

(See also 3268, 3289, 3347-3349, 3351, 3560, 3611, 4287.)

3272. GRUPPE, W.

Frostaussfälle bei der Apfelsorte Ontario in Abhängigkeit vom Ertrag des Vorjahres. (Losses due to frost suffered by the apple variety Ontario in relation to yield in the preceding year.)

ErwObstb., 1960, 2: 66-8, bibl. 1, illus.

In the winter of 1955/56 Ontario bush trees on M.XI in their 5th year suffered a yield loss due to frost injury of 61.7%, while trees of the same variety on M.IX serving as fillers in the same plot did not show any visible injury. Before the cold winter the trees on M.XI had yielded 18.6 kg./tree or 0.78 kg. per cm. of trunk circumference, whereas the yield of the trees on M.IX was only 5.7 kg./tree or 0.34 kg./cm. circumference. The severity of the injury to the M.XI trees was positively related to the yield of the previous year. The resistance to low winter temperatures was thus related to yields in the preceding year, and this factor had a greater effect on survival than any possible difference in frost susceptibility between rootstocks.—Inst. Obstb. Baumsch., tech. Hochsch. Hannover.

3273. TUMANOV, I. I., AND KRASAVCEV, O. A.

Hardening of northern woody plants by negative temperature treatment. [Russian, with English summary 1 p.]

Fiziol. Rast., 1959, 6: 654-67, bibl. 24, illus.

The greatest resistance to low temperatures was shown by woody species during the severest winter periods. After hardening under natural conditions in the Moscow region the apple variety Grušovka Moskovskaja withstood -40°C ., spruce -50°C . and birch -65°C . By additional gradual hardening in the laboratory the frost resistance of apple was increased to -60°C ., that of spruce to -70°C . and that of pine, birch and black currant to -195°C . [see also H.A., 30: 1824]. Microscopical investigations showed that slow cooling resulted in ice formation outside the cells causing them to shrink and become dehydrated, whereas rapid cooling induced ice formation inside the cells causing their death.

3274. PROEBSTING, E. L., JR.

Cold hardiness of Elberta peach fruit buds during four winters.

Proc. Amer. Soc. hort. Sci., 1959, 74: 144-53, bibl. 10.

The freezing apparatus and method of determining hardiness were basically the same as those described in an earlier paper [H.A., 27: 2257]. It was found that slow loss of hardiness of Elberta fruit buds was associated with the swelling of the buds until about a week before the first pink colour

appeared. Then there was a sudden decrease in hardiness, which was followed by a relatively constant level through the flowering and small fruitlet stages. Increases in hardiness during the dormant period were always associated with decreasing temperatures, and *vice versa*. The amount of response was variable, however, periods of low temperature producing more change in hardiness under some conditions than others. It is suggested that the weather during the preceding growing season strongly influences the ability of the buds to harden.—Irrig. Exp. Stat., Prosser, Wash.

3275. YOSHIMURA, F., AND KAMOHARA, T.

Influence of winter temperature on the dormancy of some deciduous fruit trees. III. Effect of time and length of chilling treatment on bud-opening and shoot- and root-growth of young trees of peach and Japanese persimmon. [Japanese, with English summary $\frac{1}{2}$ p.]

J. hort. Ass. Japan, 1959, 28: 177-82, bibl. 5.

Young peach (var. Okayamawase) and Japanese persimmon (var. Hiratanenashi) trees, maintained in a warm chamber at $6-11^{\circ}\text{C}$. from November to March, were chilled at -1° to 0°C . for 15 or 30 days at various times from December till February. Subsequent comparison with trees kept continuously in the warm chamber or in the open showed that chilling caused the buds to open 6-11 days earlier. It also increased the number of open buds and promoted shoot growth. In peach the 30-day chilling treatment was the most effective, but in persimmon the 15-day treatment promoted bud-opening and shoot growth, whereas the 30-day treatment retarded them. January chilling was most effective, followed by December and then February treatment. [For Part I, see H.A., 27: 3130.]

3276. TUPICYN, D. I.

The winter hardiness and developmental biology of fruit buds of plums in Uzbekistan. [Russian.]

Tr. po prikl. Botan., Genet. i Selekcii, 1957, 30: 224-47, from *Ref. Ž. (Biol.)*, 1958, No. 19, Abstr. 87,224.

A 3-year study was conducted on 7 species of plum and one of apricot from the beginning of bud differentiation to flowering. The growth of the flower primordia did not cease during the winter and was most pronounced in species with a short dormant period. Thus the diameters of the flower primordia increased more rapidly in apricot than in East Asian plums or cherry plum; they grew most slowly in varieties of *Prunus domestica* and sloe. The hardiest were the buds of species with long dormant periods, i.e. *P. domestica*, sloe and plums of North American origin.

3277. SAKAI, A.

Relation of sugar content to frost-hardiness in plants.*Nature*, 1960, 185: 698-9, bibl. 2.

An increase in the cell sugar content increased frost hardiness in mulberry and gardenia.

3278. SCULTETUS, H. R.

Die Temperaturmessungen bei den Frostbekämpfungsversuchen in Francop im Frühjahr 1959. (Temperature measurements in frost control experiments at Francop in the spring of 1959.)

ErwObstb., 1960, 2: 64-6, illus.

In the fruit growing area of the Alte Land the heating capacity of certain heaters was determined by temperature measurements during several clear nights in the spring of 1959. The degree of warming up depended on the magnitude of the temperature inversion, which forms on such nights in the air layers near the ground, and not on the temperature measured at soil level. In view of various conditions prevailing in the region of the Lower Elbe, it was found desirable to increase the temperatures of branches and flowers directly by the radiating heat of the heaters.—Agrarmeteor. Versuchs- u. Beratungsstelle, Hamburg.

3279. ZISLAVSKY, W.

Untersuchungen und Gedanken über die Wirksamkeit und Rentabilität der Frostabwehr mit primitiven (Öl-) Heizgefäßen. (Studies and observations on the efficiency and economics of frost protection by primitive (oil) heaters.) [English summary $\frac{3}{4}$ p.] *PflSch. Ber. Wien*, 1960, 24: 33-72, bibl. 15, illus.

Although irrigation is the most efficient method of frost protection to-day, an interest in area heating persists in Austria. Following preliminary experiments in 1958, a more extensive study was carried out in a 1.31 hectare cherry orchard in the second half of April, 1959, when a severe frost occurred. With 276 heaters per hectare and an hourly oil consumption of 461 kg./ha., the mean temperature during a radiation frost night was raised by 4.9° C. A repetition of the experiment during a radiation frost about a month later yielded similar results. For accurate comparisons between different heaters the use of an efficiency coefficient is recommended, which indicates the rise in temperature achieved in relation to the amount of fuel consumed. Thus, in both the 1959 experiments the efficiency coefficient was about 1° C./100 kg. oil/ha./hour. The very high temperature rises registered locally (10-45° C.) suggest that heat inversion alone is insufficient to explain the heating effect, and that convection has also to be taken into account. In describing the experiments, labour requirements have been computed where possible. The author concludes that frost protection by oil

heaters is an economic proposition provided they will burn continuously for 6-8 hours. The Riess heaters used in these experiments did not fulfil this requirement.

3280. BAUDOT, —.

Premiers résultats de la lutte contre la gelée dans les vergers au moyen de l'arrosage par aspersion. (Preliminary results of attempts to prevent frost damage in orchards by sprinkling.)

Pomol. franc., 1959, 1(11): 21.

Recommendations based on experiments in French orchards are: (1) complete and uninterrupted coverage; (2) rates of between 2.4 and 3.2 mm./hr. for protection to -6° C.; (3) continuous operation beginning at 0° C. and ceasing at 1° C., or continuing beyond this limit if the temperature rises suddenly; (4) use of sprinklers with a 1-min. rotation period; and (5) pressure of 3.5-4 kg./sq. cm. to ensure a fine spray.

3281. WITTE, K.

Frostschadenverhütung durch direkte Beregnung im Obstbau. (The prevention of frost damage to fruit trees by direct sprinkler irrigation.)

ErwObstb., 1960, 2: 61-4, bibl. 9, illus.

Experiments on the use of sprinkler irrigation to protect fruit trees from frost have shown that the following conditions must be fulfilled: Rapid rotation of the pipes carrying the nozzles, a rate of precipitation of 4.5 mm. obtained from nozzles with a diameter of 5 mm., a sprinkler spacing of 18 × 24 m., an absolute pressure of 4.5 atmospheres at the sprinkler and an early start of the operation. If these conditions are fulfilled, fruit trees will be protected from severe radiation frosts and medium wind frosts.—Versuchswirtsch. Marhof, Inst. Obstb., Univ. Bonn.

3282. BUSLOVA, Y. D.

Method of inducing early bearing in apple seedlings. [Ukrainian.]

Dopovidi Akad. Nauk Ukrain. RSR, 1958, No. 4, pp. 448-51, from *Biol. Abstr.*, Sect. D., 1959, 34, Abstr. 14,269.

One-year-old White Calville seedlings were left in the open during the first winter, but the following winter they were kept under artificial conditions at a temperature of over 15° C. Under these conditions the seedlings formed fruit buds in their third year.

3283. PRESTON, A. P.

Effect of tree density in an exposed apple orchard.

A.R. E. Mallng Res. Stat. 1959, 1960, A43: 52-6, bibl. 6, illus.

Three 10-acre apple plots were planted in 1946 on an exposed hilltop site in Kent. Each plot con-

sisted of permanent trees of Cox with Worcester, Sunset and Laxton's Fortune as pollinators, all on the vigorous rootstock M.II and planted at 25½ ft. square. The first plot consisted of permanent trees only (low density); the second had in addition one filler tree on the semi-dwarfing rootstock M.VII in the centre of each square of permanent trees (medium density); the third plot had 3 filler trees on the dwarfing rootstock M.IX to every permanent tree (high density). There was a substantial reduction in wind-flow on the relatively open low density plot compared with that for bare land, but the greatest reduction was achieved on the medium density plot. The permanent trees of Cox on the high density plot were significantly larger than those on the low density plot at 13 years of age. The permanent trees on the medium and low density plots were similar in size, those on the former plot having had serious competition from the fillers on M.VII which were as large as the permanent trees. The fillers on M.IX in the high density plot were considerably smaller than the permanent trees. The permanent trees of Cox on the high and medium density plots yielded 59% and 67% more fruit, respectively, than those on the low density plot; similar results were obtained for the pollinator varieties. Site, laceration of the foliage, tree spacing, and the choice of rootstock for the filler trees are discussed. [From author's summary. For earlier work see *H.A.*, 27: 156.]

3284. **BERGE, H.**

Durch Schwefeldioxyd bedingte Immissions-schäden an Obst- und Waldbäumen. (**Atmospheric pollution injuries to fruit and forest trees caused by sulphur dioxide.**) [English and French summaries 16 and 17 lines respectively.]

Gartenbauwiss., 1959, **24**: 220-8, bibl. 17.

Studies made within the industrial area of Nord-rhein-Westfalen show that under certain conditions plant analysis is a useful tool in the diagnosis of smoke injury. This point is illustrated by examples. The value of specifying tolerance limits for SO₂ toxicity is doubtful. The total seasonal SO₂ content of the leaves of several tree species, including apples, pears and plums, is shown in graphs.—*AgrikChem. Inst. Dr. Helmut Berge, Heiligenhaus Bez. Düsseldorf.*

3285. **BENSON, N. R.**

Fluoride injury or soft suture and splitting of peaches.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 184-98, bibl. 15, illus.

A serious disorder of peaches in which the fruit prematurely develops soft red flesh along the suture toward the apex occurred in an area (near Wenatchee, Washington) with fluoride polluted air. The symptoms were reproduced experimentally by

spraying fluoride on the trees and also by subjecting the trees to an atmosphere containing water-scrubbed fumes from heated cryolite. The condition was shown to be recognizably different from fruit symptoms caused by 2,4-D or 2,4,5-T. In the polluted area trees sprayed with lime or calcium chloride produced normal fruit. The period of retarded growth (pit hardening) was the time when lime sprays were most effective in preventing the damage. It is concluded that there is a causal relationship between the soft suture disorder and fluoride pollution of the air. [From author's summary.]—*Tree Fruit Exp. Stat., Wenatchee, Wash.*

Soil management and irrigation.

(See also 3110.)

3286. **LOEWEL, E. L., AND SCHANDER, H.**

Neue Untersuchungen zur Frage der Boden-müdigkeit. (**New investigations on the problem of soil sickness.**)

Mitt. ObstVersuchsrings Jork, 1959, **14**: 301-5, bibl. 5.

Small-scale observations and experiments in apple and cherry nurseries and orchards suggest that mulching with grass counteracts soil sickness. However, there are exceptions to this rule, and in doubtful cases testing of the soil with apple seedlings is recommended. When replanting the fruit species should be changed, if possible, and the planting of new trees in the sites where the old ones stood should be avoided.

3287. **WILSON, A. G. L.**

Cover crops in the orchard.

Tasm. J. Agric., 1959, **30**: 288-92, illus.

Recommendations on species and management for annual and permanent cover crops.

3288. **SULLIVAN, D. T., AND ENZIE, J. V.**

Cultural management methods in a young apple orchard under irrigation.

Res. Rep. N. Mex. agric. Exp. Stat. **19**, 1959, pp. 12, illus.

Three systems of orchard management under irrigation were compared on 3-year-old apple varieties Jonared, Richared and Blaxtayan: permanent sod of alta fescue (1), sod mulch (2), and no tillage but spraying with oil ± PCP (3). After 8 years' treatment (2) produced larger trees than either (1) or (3). Total fruit yield was highest on the sprayed plots, but, as trees receiving treatment (2) were the largest, the position might change in time. Treatment (1) produced fruit with more red colouring, especially on the variety Richared, indicating water and/or nitrogen deficiencies. There was no significant difference in fruit size as a result of treatments. Calculations showed that in 1957 (1) received 67.2 acre-inches in 12 irrigations, and that, with 7 irrigations each, (2) and (3) received

42 and 32.2 acre-inches, respectively. In spite of (1) receiving nearly twice the amount of water a deficiency was caused by competition from the grass.—*Weed Abstr.*, 9, No. 267.

3289. ČEJKA, G.

Vplyv obrábania pôdy na mrazuvzdornosť marhúl'. (**The effect of soil management on frost resistance in apricots.**)

Ovocnár. a Zelinár., 1957, 5: 101-2, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,513.

Apricot trees in clean cultivated, well manured plots suffered no frost damage, whereas on unmanured plots, cultivated only under the spread of the crowns and with grass in the interrows, 39-44% of the trees were injured. In the latter case it was observed that the leaves yellowed prematurely and tree growth was less vigorous owing to the high moisture uptake by the grass.

3290. FLEMING, H. K.

Growth and mortality in a young sweet cherry orchard.

Bull. Pa agric. Exp. Stat. 662, 1959, pp. 12, bibl. 12, illus.

Records of trunk circumference, yield and tree mortality during the first 10 years' growth in an orchard are given. Napoleon and Windsor scions, each on seedling rootstocks of mazzard and mahaleb, were used, and each stock-scion combination was grown under 2 systems of soil management, namely, clean cultivation with ryegrass seeded annually in August and subsequently cultivated each spring, and a permanent clover sod. All combinations grew faster under clean cultivation. Differences in the final size and yield of trees due to soil management were highly significant, but those due to scion variety or rootstock were not significant. Average annual yields were closely correlated with tree size. Varietal characters, such as hardiness and disease resistance, had a profound effect on survival through the critical pre-bearing period. Mortality was similar in cultivated and sod sections, the growth retardation by sod competition being no advantage. The number of deaths on the 2 rootstocks was equal. Half of the losses on mahaleb were Napoleon and half Windsor, but all losses on mazzard occurred with the Napoleon scion and the latter interaction was highly significant.

3291. IVANOV, S. M.

Internal causes of non-parasitic necrosis of young wood in plum trees. [Russian, with English and Moldavian summaries.]

Izv. Mold. Fil. AN SSSR, 1957, No. 6, pp. 57-75, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,828.

The causes of a withering of young plum trees in irrigated orchards along the Southern Dniester

were studied. The sudden occurrence of necrosis of young wood was found to be functional, and due to the disruption of the carbohydrate and nitrogen metabolism and to the poisoning of the living elements of the wood by ammonia resulting from the practice of growing vegetables in the interrows and the use of irrigation and fertilizers suitable for these crops but not for plums. The disorder was accentuated by liming, by cultivation of the ploughed horizon and by frequent irrigation, which caused an accumulation of toxic amounts of ammonia in the trees.

3292. DE LA ROCHA G., G., AND FLORES C., D.

Tolerancia de las diversas especies frutales al contenido de sal en el suelo. (The tolerance of different kinds of fruit trees to the salt content of the soil.)

Inf. mens. La Molina, 1958, 32(377): 11-15.

Responses to saline irrigation water [see *H.A.*, 29: 2819].

Nutrition and tree composition.

(See also 3262, 3291, 3394, 3564, 4612, 4613.)

3293. BOULD, C.

Nitrogen nutrition of fruit crops.

N.A.A.S. quart. Rev., 1959, 11: 80-7, bibl. 18.

A brief discussion dealing with the movement of N in the soil, factors affecting uptake and translocation, the N status of crops and its relation to their yields.

3294. MASON, A. C., AND WHITFIELD, A. B.

Seasonal changes in the uptake and distribution of mineral elements in apple trees.

J. hort. Sci., 1960, 35: 34-55, bibl. 9, illus.

Six-year-old M.IX on M.XVI and M.IX on M.IX apple trees, grown 3 ft. apart in rows, were lifted, one from each of 4 blocks, on each of 12 occasions at approximately monthly intervals throughout the year. Each tree was divided into several parts and samples analysed chemically for N, P, K, Ca and Mg. Two periods of special activity were distinguished, at the end of April and the end of June, when the concentrations of the 5 elements changed appreciably over a short time in most of the tissues. These two periods coincided with the onset of rapid leaf growth (April) and of shoot growth (June). The uptake of most elements began at the end of April or May and reached a maximum at the end of July or August, after which there was a loss of elements by the tree; uptake of N began about a month earlier. The question of excretion through the roots as well as by leaf shedding is briefly discussed. No net absorption of N, P, K, Ca or Mg was recorded in the autumn, though it was noted that the concentration of N in the wood and bark of the older parts of the tree

increased. At the end of the summer the bulk of each element in the tree was contained in the following organs: N in the leaves, branches and roots; P in the leaves, branches and roots; K in the leaves and branches; Ca in the leaves and bark; Mg in the leaves. [From authors' summary.]—E. Malling Res. Stat., Kent.

3295. PRIESTLEY, C. A.

Seasonal changes in the carbohydrate resources of some six-year-old apple trees.

A.R. E. Malling Res. Stat. 1959, 1960, **A43**: 70-7, bibl. 9.

Seasonal samples of bark and wood were taken from 7 regions of 6- to 7-year-old M.IX trees growing on the rootstocks M.IX and M.XVI. A new method of sugar analysis was used to obtain estimations of phloridzin, soluble sugars, starch, and hemicelluloses. Values were expressed on the basis of residue dry weight after extraction and in terms of a tree of constant size. Results indicated that sugars, starch and hemicelluloses function in support of the various phases of vegetative growth, and that the level of these resources in the tree is determined by the balance between supply from the leaves and existing cells and the demands of meristematic activity. Seasonal changes in phloridzin were not simply related to the pattern of growth. Changes in the percentage totals of extractable carbohydrates affected the whole tree, and a constant distribution between bark and wood above and below ground was maintained throughout the year. The rootstocks influenced the total quantity rather than the composition of the scion growth. [Author's summary.]

3296. BLASBERG, C. H.

Leaves tell the story.

Vt Fm Home Sci., 1957, **3**(1): 3, 14-15.

With McIntosh apples 1.8-2.2% N, 1.3-1.7% K, 1.0-1.5% Ca and 0.25-0.4% Mg were the leaf analysis ranges associated with high yields of fruit of good quality and colour.

3297. AVDEENKO, N. D.

The use of the injection method for determining the fertilizer requirements of fruit trees. [Russian.]

Nauč. Zap. Vorosilovgradsk. s.-h. In-ta, 1957, **4**(2): 63-8, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,791.

Experiments with apples have shown that the greatest response to fertilizers can be obtained by injecting NPK into branches of the second order. Within 10 days of injecting NPK (0.5% urea + 0.5% KH_2PO_4), NP or NK the growth rate of the new shoots increased considerably and the total growth increment was doubled. The injection of solutions containing P, especially with N + K, improved fruit set and yield.

3298. JOHANSSON, E., AND SAHLSTRÖM, H.

Gödslingsförsök med äpple vid Kåbbe, Gotland, 1946-1956. (Manurial trials with apples at Kåbbe, Gotland, 1946-56.) [English summary 20 lines.]

Sver. pomol. Fören. Årsskr. 1959, 1960, **60**: 61-6, bibl. 3.

Yield figures are tabulated for two apple varieties worked on three different rootstocks. The figures show that neither N nor P increased yields but that K apparently caused an increase both in yield and fruit size.

3299. OLAND, K.

Nitrogen feeding of apple trees by post-harvest urea sprays.

Nature, 1960, **185**: 857, bibl. 6.

It is suggested that, although leaf injury is occasioned by higher than normal concentrations of urea sprays, such application in the late autumn would not reduce the total amount of photosynthetic products to any extent. A 4% spray in mid-October increased the total organic N content of the leaves by 51% within 2 days, and much migrated into the tree, so that by mid-November the spurs, with developed blossom buds, contained 31% more N than the controls and the terminal shoots 16% more. The amount of N absorbed from a single spray was comparable to a net intake of 30-40 kg. N per ha.—Ullensvang Res. Stat., Lofthus, Hardanger.

3300. MOCHIZUKI, T., AND HANADA, S.

The phosphorus nutrition of apple trees. Part 2. The status of phosphorus nutrition of apple trees growing in allitic soils. [Japanese, with English summary $\frac{1}{2}$ p.]

Bull. Fac. Agric. Hirosaki Univ., 1959, No. 5, pp. 32-45, bibl. 29.

The P contents of leaves, shoots and roots of apple trees growing in an allitic soil, derived from volcanic ash, were compared with those of trees growing in a siallitic soil. No decrease in P content due to the allitic soil was detected in the middle leaves of the shoots, but 1-year-old shoots and fibrous roots showed distinct decreases, especially of inorganic P. It is suggested that leaf petiole analysis may be more sensitive to changes in P nutrition than leaf blade analysis. [For part I, see *H.A.*, 29: 126.]

3301. WARD, J. R.

Copper deficiency in young apple trees in Tasmania.

Tasm. J. Agric., 1959, **30**: 329-32, bibl. 2, illus.

Wither tip or summer die-back, which retarded the growth of the young apple trees on poor acid soils, is described. Trials showed that it was due to Cu deficiency and could be controlled by sprays of bordeaux at 3 : 2 : 40 or of copper oxychloride at

4 lb./100 gal., applied in the second week of October [spring].

3302. GRUPPE, W.

Zur Beurteilung und Behebung von Magnesiummangel beim Apfel. (**On the diagnosis and cure of magnesium deficiency in apples.**)

ErwObstb., 1960, 2: 51-3, bibl. 5.

An annual supply of 30 kg. of Mg per ha. is considered desirable.

3303. DIMZA, I.

Spraying apples with a solution of microelements. [Latvian, with Russian summary $\frac{3}{4}$ p.]

Vest. Zin. Akad. LatvPSR, 1959, No. 7, pp. 149-56, bibl. 25.

Apple trees, growing in a calcareous turf soil, with a pH of 7-7.5, and containing little Fe and no trace of Zn or Mn, were sprayed with 0.1-0.3% boric acid. When this was done during the flowering period, when meteorological conditions were unfavourable for pollination, a considerable increase in fruit yield occurred compared with that of unsprayed trees. When trees affected by frost and later by chlorosis were sprayed with 0.2-0.4% iron sulphate they recovered and made normal growth; yields were also increased.

3304. EVTUŠENKO, G. A., AND ŠPOTA, L. A.

The intensity and qualitative trend of photosynthesis in chlorotic apple trees. [Russian, with English summary $\frac{1}{4}$ p.]

Fiziol. Rast., 1959, 6: 679-85, bibl. 11.

Carbon-14 was used in this study in Kirgizia, where chlorosis of apple trees was found to be due to a deficiency of physiologically available iron. The amount of pigments in the chlorotic leaves was lower, and the carotenoid : chlorophyll ratio higher, than in healthy leaves. The photosynthetic activity of chlorotic leaves was lower than that of green leaves, and they synthesized relatively more raw cellulose and substances in the water, base and acid fractions (which contain mainly organic acids and proteins) and lesser amounts of substances in the benzene and alcohol fractions (which contain pigments, soluble sugars and other organic substances). As a means of correcting chlorosis, injecting an Fe salt into the stem or roots was better than spraying.

3305. (WILCOX, F. A.)

Cure for iron chlorosis.

Amer. Fruit Gr., 1960, 80(2): 48.

According to 5 years' experience by a Californian grower, Greenz 26, which is not a chelate but an iron product derived from wood, has given excellent regreening of chlorotic pear foliage, and has improved the vigour of the trees and the yield and quality of the fruit. The first spraying is given in April, and if necessary up to 4 applications may be made at 3-4-week intervals.

3306. ANON.

Sweeter tart cherries.

Amer. Fruit Gr., 1960, 80(4): 50.

Spray applications of Nu-Iron, an organic iron compound, increased the sugar content and colour of Montmorency cherries.

3307. RYUGO, K., AND DAVIS, L. D.

The effect of the time of ripening on the starch content of bearing peach branches.

Proc. Amer. Soc. hort. Sci., 1959, 74: 130-3, bibl. 6.

The starch content of bearing one-year-old branches of peach varieties maturing at different times was studied. Starch in these branches decreased as harvest approached, suggesting its transformation and subsequent utilization by the fruit. This relative dependence of the fruit upon the reserve material correspondingly decreased as the varieties matured later in the season. This was interpreted as an illustration of the competition between the maturing crop and the vegetative growth for photosynthates. [From authors' summary.]—Univ. Calif., Davis.

3308. RYUGO, K., AND DAVIS, L. D.

The comparison between the net assimilation rate of peach leaves and the rate of accumulation of dry weight by the crop.

Proc. Amer. Soc. hort. Sci., 1959, 74: 134-43, bibl. 6.

The relative ability of peach leaves to supply the dry matter requirements of the maturing peach crop was measured by comparing the rate of apparent photosynthesis with the rate at which dry matter was accumulated by the fruits. In both cases the data were expressed as amount of ash-free dry matter per sq. dm. per day; the former was termed the net assimilation rate, the latter the net utilization rate. The net utilization rates of the Coronado variety, with a larger crop and smaller number of leaves, were higher than those of Corona for comparable intervals of fruit development; the average value for Coronado for the entire experimental period was approximately 50% larger than that for Corona. The ratio of the net utilization rate to the net assimilation rate, which represents the proportion of the dry matter produced by the leaves which was utilized by the fruits, varied from 0.11 to 0.51 for the two varieties. Comparisons have been made between the average values of the net utilization rates and between the ratios of the average values of the net utilization rates to the net assimilation rates for the two varieties. Differences in these values have been related to the number of fruits borne by each tree, to the average leaf area, and to the total ash-free dry weight accumulated by the crop during the period of investigation, and certain suggestions are made to account for them. [From authors' summary.]—Univ. Calif., Davis.

3309. LIWERANT, J.

Effets des principaux éléments fertilisants sur le développement végétatif et sur la fructification du pêcher. (**Effects of the main fertilizing elements on the vegetative development and fruiting of the peach.**)

C.R. Acad. Agric. Fr., 1959, 45: 818-26, bibl. 9.

The effects of deficiencies of N, P and K on growth and fruiting are presented and discussed. Lack of N or K reduced the vigour and the fruiting capacity of the tree. N-deficient trees flowered abundantly, but the fruits had to be thinned if they were to be marketable. K deficiency reduced fruit bud formation. Lack of P caused less reduction in vigour and fruiting, but simultaneous deficiency of P and K caused severe stunting, especially of the root system.—Stat. agron., Toulouse.

3310. DELMAS, J., BATS, J., AND MARÉNAUD, C.

Étude de l'importance du phosphore dans l'alimentation du pêcher en milieu contrôlé. (**The importance of phosphorus in the nutrition of peaches in sand culture.**)

C.R. Acad. Agric. Fr., 1959, 45: 792-5.

See H.A., 29: 3261 and 3262.

3311. BADRINAS VANCELLS P.

La clorosis férrica de los árboles frutales en suelos calcáreos. I. Aplicación de los distintos métodos de diagnóstico, con especial referencia al melocotonero. II. Corrección y tratamiento. (**Iron-deficiency chlorosis of fruit trees on calcareous soils. I. Application of different diagnostic methods, with special reference to peaches. II. Correction and treatment.**)

Rev. Inst. agríc. catal., 1960, 109: 1-8, 33-45, bibl. 46, illus.

Chlorosis of peach trees in 2 localities was investigated by studying visual symptoms, injecting dissolved nutrients into petioles and solid Fe salts into the trunks, foliar spraying with Fe, and analysis of the leaves, soil and irrigation water. In both orchards petiole injection confirmed the Fe deficiency diagnosed by the other methods, and trunk injection was an effective cure. The Mn content of the soil was not determined, but the degree of Mn deficiency revealed by petiole injection was directly related to the degree of Fe deficiency. Reduction of soil pH by applying sulphur or sulphuric acid has not proved sufficiently effective or economic for large-scale introduction. The history of the development of curative applications of Fe is described, with considerable detail relating to chelates, and recent work on lime-tolerant rootstocks is reviewed. Replacement of clean cultivation by natural ground

flora in one peach orchard cured the chlorosis in 2 months, but the application of potassium chloride at 0.75 kg. per tree enhanced the Fe deficiency, and sodium nitrate at the same rate had even more adverse effects. In another orchard, where the soil had a higher content of active Ca, the symptoms were only slightly reduced by several years of cover cropping without cultivation, and were unchanged where strawberries were introduced as an intercrop. Neither farmyard manure nor soil applications of ferrous sulphate solution had any curative effect, and the latter was toxic at 3 kg./10 l. per tree, but good results were obtained in 8-15 days from solid injections of ferrous sulphate, with or without additional Mn and Zn. Early May was the best time for these injections; later treatments were less effective, and those carried out in June and July were toxic. The effects lasted 2 years, and included increased resistance to shot hole (*Clasterosporium carpophilum*). Doubling the normal dose in the hope of prolonging the effect proved temporarily toxic. Soil applications of 10 g. of an iron chelate in 5 l. of water round the base of each tree gave a very rapid return of leaf colour, an increase in growth and a retardation of leaf fall. However, some shoots developed slight symptoms of Zn (and possibly Mn) deficiency, which were much more apparent where the application rate was increased. Foliar spraying with Na Fe EDTA at 0.1% with Sulfatex as spreader was slightly toxic and gave a 40-50% return of green colour. The addition of Na Mn EDTA and Zn EDTA, both at 0.05%, markedly increased the effectiveness of the iron chelate with only a slight increase of toxicity. Urea at 0.5% was almost as good an additive. At higher concentrations the greater effect of Na Fe EDTA was offset by greater toxicity. Only freshly prepared solutions gave satisfactory results, and in general foliar application was inferior to injection and to soil application. The rootstock known locally as Prunell (a variety of *Prunus insititia*) shows considerable resistance to lime-induced chlorosis, but is suspected of carrying mosaic virus.

3312. BAXTER, P.

Treatment of manganese deficiency in peach trees.

J. Agric. Vict., 1959, 57: 704-5, illus.

Symptoms of Mn deficiency are described. Foliage sprays of various concentrations of MnSO_4 on 5-year-old, Mn-deficient peach trees improved leaf colour and shoot growth. The best results were obtained with an autumn spray, immediately after harvest, of 10 lb. MnSO_4 plus $2\frac{1}{2}$ lb. Limil/100 gal. and a spring spray, applied soon after fruit set, of 5 lb. MnSO_4 plus $1\frac{1}{4}$ lb. Limil/100 gal. In trials on apple trees neither dormant winter sprays nor soil applications were effective.

3313. MAMEDNIAZOV, O. N., SOLOV'eva, N. V., AND KULIEV, P.

The chemical composition of mulberry leaves. [Russian.]

Izv. Akad. Nauk TurkmSSR, 1959, No. 1, pp. 124-6, bibl. 4.

Studies of mulberry leaves from the variety Hasak showed that the spring leaves possess the highest contents of moisture and P. As the leaves mature the P content decreases steadily until the middle of June, after which it remains constant until the middle of September. The young leaves are low in carbohydrates, but at the end of March the sugar content increases markedly. The young leaves are high in N, which decreases with maturity.

3314. GUSEJNOV, B. Z.

Metabolism, size, and development of white mulberry as affected by different proportions of mineral fertilizers. [Russian.]

Izv. Akad. Nauk AzerbSSR, Ser. biol., 1959, No. 1, pp. 9-19, bibl. 22.

B and Mn applied with NP fertilizers to mulberry seedlings increased catalase activity but decreased the intensity of respiration. The treatment caused increased accumulation of chlorophyll in the leaves and of dry matter in the leaves and roots.

3315. GUSEJNOV, S. G.

The effect of micro-elements on carbohydrate and protein metabolism in white mulberry. [Azerbajdzan, with Russian summary $\frac{3}{4}$ p.]

Izv. Akad. Nauk AzerbSSR, Ser. biol., 1959, No. 5, pp. 81-9, bibl. 11.

Applications of Cu, Zn and Co stimulated the formation of carbohydrates in mulberry trees.

Growth and physiology.

(See also 3102, 3167, 3184, 3185, 3295, 3304, 3307, 3308, 3568.)

3316. BARLOW, H. W. B.

Root/shoot relationships in fruit trees.

Sci. Hort., 1960, 14: 35-41, bibl. 10.

A critical review of the literature.

3317. ROGERS, W. S., AND BOOTH, G. A.

The roots of fruit trees.

Sci. Hort., 1960, 14: 27-34, bibl. 9, illus.

A review of the literature on factors affecting root growth, with particular reference to apple rootstocks.

3318. RUDLOFF, C. F., AND LUCKE, R.

Wechselbeziehungen zwischen Wachstum, Blütenbildung und Fruchten bei verschiedenartigen Apfelsprossen. (**Interrelations between growth, flower formation and fruiting in different kinds of apple shoot.**)

ErwObstb., 1960, 2: 21-4, 53-6, bibl. 14, illus.

The following interrelationships were found to exist between the vegetative and generative development of apples. (1) There is a close connection between the length of a shoot in the previous year and its elongation in the current year. The diameter of the new growth is proportional to the diameter of the previous year's wood. (2) A moderate inhibition of shoot growth must be considered as a prerequisite for flower formation. "Optimum" fruiting shoots (up to 15 cm. long) bear the most flower buds and the inflorescences are morphologically normal. Weaker, shorter shoots form flower buds more rarely and have fewer flowers in the inflorescence, while stronger, longer shoots are too vigorous for the optimum formation of normal inflorescences. (3) Flower and fruit development has an inhibiting effect on shoot growth. In comparison with vegetative shoots, flower-bearing shoots show a much lower growth rate. Fruits do not inhibit the growth of laterals arising from the same point, but the development of fruits leads to a decline of shoot growth in general. (4) Finally, relationships exist between flower formation and fruit set, and between flower formation in the previous and in the current year. In general, flowers do not set on a lateral that arises from the point of attachment of a fruit of the previous year. Inflorescences which do not produce any fruit may produce laterals with many more flower buds the following year. Excessive flowering, especially if it is associated with good fruit set and a low rate of extension growth, appears to induce a biennial bearing habit in the following year. In respect of pruning these findings suggest that the old fruiting wood should be removed annually, while the newly-formed long shoots should be left unpruned unless they are needed to build up the framework.—Inst. Obstb. u. Gemüseb. landw. Hochsch. Stuttgart-Hohenheim.

3319. FEUCHT, W.

Welche Faktoren führen bei den Obstgehölzen zur Blütenanlage? (**What factors lead to the formation of flower buds in fruit trees?**)

ErwObstb., 1960, 2: 47-9, bibl. 12, illus.

The interrelations between flower bud formation, rate of growth and flower-inducing substances are discussed.

3320. LONGLEY, R. P.

A study of the relationship between the amount of bloom and yield of apples.

Canad. J. Plant Sci., 1960, 40: 52-7, bibl. 7.

The fruit yield of apple trees per unit area of trunk cross-section is shown to be very closely related to the author's estimate of the amount of bloom. Trees with maximum bloom score produced 46.48 kg. of fruit per 100 sq. cm. of trunk cross-section, and lower percentages of bloom showed a linear relationship between the amount of bloom

and yield of fruit. [Author's abstract.]—Canada Dep. Agric., Kentville, N.S.

3321. SAHULKA, J., AND SÍLOVÁ, A.

Free amino acid relations in apple leaves before and during the differentiation of flower buds. [Czech and Russian summaries $\frac{1}{2}$ p. each.]

Biol. Plant., Prague, 1960, 2: 70-5, bibl. 18.

During flower bud differentiation on the fruit spurs of Ontario on M.IX arginine practically disappeared from the leaves. Before differentiation there was a temporary drop in the aspartic acid content and a temporary rise in the γ -amino-butyric acid content.—Czech Acad. Sci., Prague.

3322. ROMAŠKO, JA. D.

Some results of an investigation on photosynthesis in the crown of an apple tree. [Ukrainian, with English and Russian summaries $\frac{1}{2}$ p. each.]

J. Bot. Acad. Sci. Ukr., 1959, 26(4): 32-42, bibl. 14.

Great differences in rate of photosynthesis were observed between individual leaves on different parts of a branch.

3323. MOSSE, B.

Observations on the extra-matrical mycelium of a vesicular-arbuscular endophyte.

Trans. Brit. mycol. Soc., 1959, 42: 439-48, bibl. 10, illus.

The morphology of the mycelium and variation in the number of hyphal connections of this endophytic mycorrhiza of apple and strawberry roots are discussed. The number of points at which the mycelium entered roots varied from 2.6 to 21.1 per mm. of root length, according to the season, environment and manurial treatment.—E. Malling Res. Stat., Kent.

3324. OTTO, G.

Vesikeln der endotrophen Mykorrhiza im Zentralzylinder der Wurzeln von Apfelsämlingen. (Vesicles of the endotrophic mycorrhiza in the central cylinder of apple seedling roots.)

Naturwissenschaften, 1959, 46: 235, bibl. 2, illus.

3325. HATCHER, E. S. J.

Auxin relations of the woody shoot. The distribution of diffusible auxin in shoots of apple and plum rootstock varieties.

Ann. Bot. Lond., 1959, 23: 409-23, bibl. 16.

Surveys have been made of diffusible auxin in the stem tissues of growing shoots of apple and plum rootstock varieties. Using agar plates as carriers auxin was collected from the lower surface of isolated stem sections and assayed by the *Avena* curvature method. The stool and layer shoots studied grew for several months, producing many

leaves and reaching considerable lengths. The data provide information on selected internodes and show the auxin status of the shoot at various times during growth, and the auxin gradients down the stem at these various times. Free auxin content of the shoot apex was consistently less than that of the internodes below. In 1946 auxin content declined throughout growth, with a steady positioning of the auxin peak in the upper shoot. In 1947, following a period of drought when growth almost ceased, a secondary auxin peak occurred positioned in lower internodes distant from the apex. This seasonal contrast was reflected in the auxin relations of the individual internodes, and was observed both in apple and plum. The nature of the auxin decline below the peak region, and the total disappearance of free auxin from the shoot as growth subsides, is discussed. The reappearance of free auxin in mature internodes, which has not been transmitted from the stem apex, implies either derivation from a stored state or the ability of the internode to produce its own auxin. [Author's abstract.]—Imp. Coll., London.

3326. BIGGS, R. H.

The physiological basis of the periodicity of growth in fruit trees.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 119-20.

Growth inhibitors have been found to occur in both dormant and growing peach buds, but in dormant buds they seem to be present in much larger quantities, indicating that inhibitors may be the primary factors controlling bud dormancy in peaches.

3327. HENDERSHOTT, C. H., AND WALKER, D. R.
Seasonal fluctuation in quantity of growth substances in resting peach flower buds.

Proc. Amer. Soc. hort. Sci., 1959, 74: 121-9, bibl. 18.

HENDERSHOTT, C. H., JR.

The growth-promoting and inhibiting substances in resting peach flower buds.

Diss. Abstr., 1959, 20: 1519-20, being L.C. Card No. Mic. 59-4688, of 165 pp.

Three growth-promoting substances and one inhibiting substance were found in dormant peach flower buds. The promoters were present in biologically, but not statistically, significant quantities. The greatest quantities occurred in the buds during January, February and early March. They chromatographed in the same position as IPyA (R_f 0.15), IAA (R_f 0.36) and EtIA or IAN (R_f 0.89). The inhibitor was detected on the chromatograms at an average R_f of 0.56. It was present in high concentrations in August, decreased to a very low level in October, then again increased in November and remained high until February, after which it declined and completely disappeared from the buds 2 weeks before flower-

ing. A close correlation was observed between the growth of buds on excised twigs and the disappearance of the inhibitor. Evidence was obtained suggesting that the substance is naringenin (5,7,4'-trihydroxyflavanone). [See also *H.A.*, 30: 221.]—N.C. St. Coll.

3328. POWELL, L. E., CAIN, J. C., AND LAMB, R. C.
Some responses of apple and pear seedlings to gibberellin.
Proc. Amer. Soc. hort. Sci., 1959, 74: 82-6, bibl. 8.

Young apple seedlings were sprayed with gibberellin using concentrations of 1, 10, 100 and 1,000 p.p.m., at time intervals of twice weekly, weekly, every 2 weeks, and every 4 weeks, over a period of 16 weeks. Limited or no response in several physical measurements was obtained except at the highest concentration applied twice weekly or weekly. When gibberellin, 1,000 p.p.m., was applied twice weekly there was: (1) more linear growth per tree represented by shoots of small diameter, (2) more growing points per tree, (3) a greater number of leaves per tree, (4) smaller leaves, (5) no significant change in dry weight per tree, (6) a smaller root/top ratio. Young pear seedlings were sprayed with gibberellin concentrations of 100, 300 and 1,000 p.p.m. This resulted in less total linear growth than the controls. [Authors' summary.]—N.Y. agric. Exp. Stat., Cornell Univ.

3329. WALKER, D. R., AND DONOHO, C. W., JR.
Further studies of the effect of gibberellic acid on breaking the rest period of young peach and apple trees.
Proc. Amer. Soc. hort. Sci., 1959, 74: 87-92, bibl. 5, illus.

Two-year-old dormant peach and apple trees held at 40° or 65° F. for 2 or 4 weeks were sprayed with various concentrations of gibberellic acid (GA). GA broke the rest period of peach trees [see also *H.A.*, 28: 1112], but not of the apple trees. The shoot growth of the peach trees increased significantly with each increase in concentration of GA applied. Peach trees which received only the 120 hours of chilling below 45° F. in the field grew normally when treated with 100 p.p.m. GA. Trees which received higher concentrations of GA (500 or 1,000 p.p.m.) began growth soon after treatment, but the growth was mainly from the terminal buds. Storage temperature before GA treatment was apparently not the main factor in the breaking of rest of the peach trees when 500 or 1,000 p.p.m. GA sprays were used; however, trees held at 40° F. started growing a few days earlier than those held at 65° F. when 100 p.p.m. GA was used. In general, trees held in storage 2 weeks before treatment, receiving either 500 or 1,000 p.p.m. GA, grew slightly better than trees held in storage for 4 weeks before treatment. The terminal buds on the apple trees

started growing soon after GA treatment, but only small tufts of leaves developed. Trees held at 65° and 40° F. responded similarly; likewise there were no differences in growth between the trees receiving the 1,000 or 4,000 p.p.m. GA sprays. Growth was not apparent on the untreated trees. [Authors' summary.]—N.C. St. Coll., Raleigh.

3330. HULL, J., JR., AND LEWIS, L. N.
Response of one-year-old cherry and mature bearing cherry, peach and apple trees to gibberellin.
Proc. Amer. Soc. hort. Sci., 1959, 74: 93-100, bibl. 8, illus.

One-year-old greenhouse-grown Montmorency cherry trees, which had produced terminal buds, initiated a second flush of growth following foliar applications of 100, 500 and 1,000 p.p.m. of GA on 21 May. Increases in total linear growth resulted from shoot development from both lateral and terminal buds. All treatments produced a significant increase in trunk diameter. Fresh and dry weights of the tops increased with increasing spray concentrations of GA. The weight of roots, however, was not affected. Repeat applications of GA in July did not prove beneficial. The flowering and fruiting of bearing peach and cherry trees in 1958 were not affected by applications of 10 or 100 p.p.m. of GA during full bloom in 1957. A post-bloom (28 May) spray of 100 p.p.m. of GA on bearing cherry and peach trees in 1957 resulted in partial inhibition of flowering in Montmorency cherry trees and complete inhibition of flowering of peach trees in 1958. Similar spray treatments on bearing apple trees produced no effect on flowering or vegetative growth. [Authors' summary.]—Mich. St. Univ., E. Lansing.

3331. BRADLEY, M. V., AND CRANE, J. C.
Gibberellin-induced inhibition of bud development in some species of *Prunus*.
Science, 1960, 131: 825-6, bibl. 7, illus.

Development of both floral and vegetative buds was inhibited by the application of gibberellin to branches of *Prunus* species. The development of the lateral meristem was blocked, in general, through inhibition of mitosis, while, concurrently, the growth of certain other plant organs was stimulated in some cases. That higher dosages were required to block vegetative than floral bud growth suggests that gibberellin also exerts the more specific effect of inhibiting floral initiation. [Authors' abstract.] The lowest dosages to cause complete inhibition of bud development in peach, apricot, cherry, almond and plum were respectively as follows: over 500, 50, 250, 50 and 500 mg./l. for flower buds and over 500, 250, over 500, 250 and 250 mg./l. for vegetative buds. Except for a single application to cherry flower buds, 2 applications sufficed in all cases.—Univ. Calif., Davis.

3332. KOVÁČOVÁ-FERJANČIKOVÁ, V.

The effect of gibberellic acid on the stem development in a culture of peach seedlings.

Naturwissenschaften, 1959, 46: 454, bibl. 10.

When embryos of immature peach fruits were germinated on a suitable medium, dwarf seedlings developed as rosettes of small leaves with no apparent tip to the stem. For 70 days the plants remained unchanged; but after this period one drop of 0.02% GA applied daily to the centre of the rosette caused the stem to grow and to reach a length of about 10 cm. in 12 days. Treatment of the unchanged controls a month later had similar results.—Komensky Univ., Bratislava.

3333. BLOMMAERT, K. L. J., AND HURTER, N.

Growth response of physiologic dwarf seedlings of peach, apricot and plum to gibberellic acid.

S. Afr. J. agric. Sci., 1959, 2: 409-11, bibl. 4, illus.

Unstratified embryos of stone fruit seeds will germinate if the stone and seed coat are removed, but they give rise to physiologically dwarfed seedlings. Seedlings from unstratified, freshly harvested embryos of peach (var. Kakamas), apricot (var. Royal) and plum (var. Satsuma), sprayed with potassium gibberellate at 200 p.p.m. a.e. weekly for 6 weeks, developed long internodes and chlorotic leaves, the chlorosis disappearing after the treatment was discontinued. Subsequent growth appeared normal. This GA treatment is considered to be a time-saving alternative to stratification.—W. Prov. Fruit Res. Stat., Stellenbosch.

Training, pruning and grubbing.

3334. McELROY, G. H.

Apples in the small garden.

Mon. agric. Rep. Minist. Agric. Belfast, 1959, 34: 201-5.

Advice on planting, training and pruning for the cordon espalier and dwarf pyramid systems, and on suitable varieties.

3335. BRET, J.

Une méthode rapide et économique pour la formation "en gobelet" des arbres fruitiers à pépins. (A rapid and profitable method of training "goblet"-shaped pome-fruit trees.)

Pomol. franç., 1959, 1(10): 9-11, bibl. 2, illus.

The young grafted tree should not be cut back until the end of the 2nd season after planting. By that time it will have a strong root system and enough vigorous shoots will develop in the 3rd year to ensure outward curvature of those at the base of the scion, intended as the framework. The upper vertical branches should not be removed before the end of the 3rd or 4th year after planting.

The advantages of this procedure are thickening of the trunk, slower growth of the branches destined for the framework, and earlier bearing than in trees cut back in their first year. These advantages are particularly desirable where the rootstock M.IX is used for apples.

3336. MODORAN, I.

Sporirea producției de fructe la măr cu ajutorul tăierilor. (**Increasing apple yields by pruning.**) [English, French, Russian and German summaries $\frac{1}{2}$ p. each.]

Grăd. Via Liv., 1959, 8(10): 40-3 + summaries, illus.

Varieties are classified into 3 groups according to shoot vigour. The most vigorous group should be pruned back to 6-8 buds and the others to 3-4 buds. The optimum ratio between numbers of fruit and vegetative buds depends on leaf size, being 1 : 2, 1 : 3 and 1 : 4 respectively for varieties with large, medium and small leaves.

3337. LALATTA, F., SOLAROLI, V., AND FERRAGUTI, A.

Curvatura dei rami ed allegagione nel melo Abbondanza. (**Branch curvature and fruit set in the apple variety Abbondanza.**)

Frutticoltura, 1960, 22: 17-21, bibl. 3, illus.

In this biennial-bearing variety, bending down the potential fruiting branches of palmette-trained trees in early March had a markedly beneficial effect on fruit set and yield, particularly on the upper branches. The average yield was 2.85 times as high from down-curved as from unbent branches.

3338. LIEBSTER, G.

Untersuchungen über die Zweckmässigkeit des Herunterbindens von Langtrieben bei Birnen. (**Studies on the expediency of tying down the long shoots of pears.**)

ErwObstb., 1960, 2: 41-4, illus.

The experimental results presented clearly show that tying down the long shoots induces earlier cropping in most pear varieties, and especially in those with an upright growth habit. There is no objection to bending the shoots below the horizontal. The relationship between leader and lateral shoots was not upset by the treatment, nor was the distribution of flower buds affected on the treated shoots.—Inst. Obstb. tech. Hochsch., München.

3339. VAN CAUWENBERGHE, E.

La taille des productions et des branches fruitières chez le poirier, cultivé en formes régulières. (**The pruning of spurs and fruiting branches in trained pear trees.**)

La taille de poiriers cultivés en formes régulières. (**The pruning of trained pear trees.**) *Courr. hort.*, 1959, 21: 501-4, and 1960, 22: 17-20, illus.

The first article describes treatments for spurs,

suckers, ordinary branches and various types of fruiting branch during training. The second deals with the maintenance of good shape and production in older trees.

3340. KEMMER, E.

Stümmelungsversuche. (**Deheading experiments.**)

ErwObstb., 1960, 2: 45-7, illus.

The very severe method of cutting back fruit trees described here is considered to be a worth-while substitute for grubbing filler trees. In experiments with pome and stone fruit trees, competition in the orchard resulting from close planting was overcome, the permanent trees remained unaffected and the deheaded trees bore some fruit a few years after the operation.—Inst. Obstb. tech. Univ. Berlin.

3341. SCHULZ, F.

Lockerung eines Pflaumenbestandes durch Stümmeln. (**Thinning a plum plantation by deheading.**)

ErwObstb., 1960, 2: 73-4, illus.

Severe lopping of the filler trees in an orchard is advocated as an alternative to grubbing. The permanent trees developed satisfactorily after the removal of the competition, and from the 3rd or 4th year after the operation the deheaded trees yielded an additional crop for a period of 5-7 years. Tabulated data are presented on the circumference of the stem and the yields of deheaded and untreated trees.—Inst. Obstb. tech. Univ. Berlin.

3342. TER HORST, J. A.

Rooien is niet duur? (**Grubbing trees is not expensive.**)

Fruiteelt, 1960, 50: 228-9, illus.

An account is given of a demonstration of fruit tree grubbing in Geldermalsen, using a bulldozer, a hydraulic crane, motor chain saws and tractors. Costs are analysed.

Pollination and fruit development.

(See also 3101, 3514, 3515, 4597.)

3343. HORTICULTURAL EDUCATION ASSOCIATION FRUIT COMMITTEE.

The pollination of fruit crops. Part I. Factors affecting pollination and fruit-setting. *Sci. Hort.*, 1960, 14: 126-50, bibl. 52, illus.

An account of the basic principles involved is followed by a survey of the way in which these processes in tree and small fruits are influenced by internal and external factors.

3344. AUBERTIN, M. P.

The growth and development of embryo and endosperm in relation to seed abortion in certain tetraploid apples.

Diss. Abstr., 1959, 20: 15-16, being *L.C. Card No. Mic.* 59-1999 of 54 pp.

Wrixparent and Giant Yellow Transparent (both diploid-tetraploid-tetraploid chimeras of the diploid Yellow Transparent) showed an embryogeny similar to that of other varieties. The interval between pollination and fertilization was longer with lateral flowers than with terminal flowers, and with tetraploid Jonathan pollen than with diploid Jonathan pollen. Mature embryos were found 69 days after pollination in both diploid- and tetraploid-pollinated embryo sacs. Factors thought to contribute to the high rate of seed abortion in both varieties included low flower vigour, lack of fertilization, and a possible incompatibility between tetraploid Jonathan and Wrixparent. There were indications that seed abortion in these apples may occur over a relatively long period. Seed germination was higher in crosses involving diploid pollen than in those involving tetraploid pollen.—Univ. Ill., Urbana.

3345. MÜLLER, K. W.

Über Verwachsungen an Äpfeln. (**Deformities in apples.**)

Obstbau, 1959, 78: 136, 152, from abstr. in *InformDienst Weihenstephan*, 1959, No. 12, p. 182.

Observations in 1956 and 1958, which followed years of low yields, suggest that an accumulation of reserve materials at the point of attachment of the fruit, caused by deficient fruit formation in the previous year, leads to malformations. The form these abnormalities take appears to depend on the variety. Different anomalies are described in connection with the varieties in which they are likely to occur.—Staatl. Lehr- u. ForschAnst. Gartenb. Weihenstephan.

3346. SIMONS, R. K., AND AUBERTIN, M. P.

Development of epidermal, hypodermal and cortical tissues in the Golden Delicious apple as influenced by induced mechanical injury.

Proc. Amer. Soc. hort. Sci., 1959, 74: 1-9, bibl. 16, illus.

The effects of wounding at different stages of fruit development on tissue growth, fruit appearance and russetting.

3347. SIMONS, R. K.

Anatomical and morphological responses of four varieties of apples to frost injury.

Proc. Amer. Soc. hort. Sci., 1959, 74: 10-24, bibl. 1, illus.

The effects of frost injury occurring just after full bloom are described in detail, with microphotographs, for the fruits of Starking, Golden Delicious, Jonathan and McIntosh at various stages of development up to maturity. [For earlier studies on Golden Delicious, see *H.A.*, 27: 3251.] The injury persisted until maturity, affecting shape, pigmentation and susceptibility to russetting.—Univ. Ill., Urbana.

3348. TUKEY, L. D.

Observations on the russetting of apples growing in plastic bags.

Proc. Amer. Soc. hort. Sci., 1959, 74: 30-9, bibl. 14, illus.

Russetting of apples developed extensively on fruits covered by bagging materials impervious to moisture. The results indicated that the moisture content of the air about the fruit is an important factor in promoting russetting of apples, as was demonstrated on fruits of Golden Delicious and Rome Beauty. The amount of russetting seemed to be related to the duration of exposure as well as to the age of the fruit at the time of exposure to moist air conditions. It is suggested that moisture may influence initially the condition of the cuticle and secondly the formation of periderm. Other factors such as frost, spray materials, mechanical injury and varietal characteristics would also contribute to russetting of apples. [Author's summary.]—Pa St. Univ., University Park.

3349. VAN BELLE, O. C.

Vruchtverruwing op Golden Delicious. (Fruit russetting in Golden Delicious.)

Fruittelt, 1960, 50: 266-7, 263, illus.

Trials and observations over several years have shown that the following factors may cause russetting in Golden Delicious apples: dry soil, delay in irrigation during drought, night frosts or cold weather during flowering, an exposed position, spraying with water with a high iron content, mildew infection, certain spray materials, and conditions which delay drying after spraying.

3350. STILES, W. C., AND OTHERS.

Effects of urea sprays and pesticides on russetting and cracking of Stayman apple.

Proc. Amer. Soc. hort. Sci., 74: 25-9, bibl. 10.

In tests over a 3-year period urea, applied either alone or in various early-season spray combinations, had no significant effect on fruit cracking or russetting. In one year ferbam sprays were associated with the occurrence of enlarged cork lenticels, and in another year sulphur-ferbam sprays resulted in a small increase in russetting. Cracking was not consistently associated with any spray material or combination of materials, but was found to increase with an increase in russetting or other injury to the fruit.—Rutgers Univ., New Brunswick, N.J.

3351. ROOTSI, N.

Mognadsprocess och sprickbildning hos plommon. (Ripening and skin cracking in plums.) (German summary 1½ p.)

Sver. pomol. Fören. Årsskr. 1959, 1960, 60: 117-27, bibl. 7.

Fruits will split when the pressure of the flesh exceeds the tensile strength of the skin. These

two phenomena were studied in relation to the ripening of plums. One of the causes of pressure in the fruit flesh of plums is the swelling of its colloidal substances, which is brought about by the osmotic absorption of water. In this connection the concentration of the cell sap is of importance. The tensile strength of 5 mm.-wide strips of skin was barely 50 g. when the skin was wet, but it amounted to 300-400 g. after one day's drying between two layers of filter paper. During ripening the strength of the skin decreased as a result of an increase in moisture, while the cell sap concentration increased in most varieties. In general, both fruits with burst skins and fruits on the sunny side of the trees showed higher refractometer readings for cell sap than did intact or shaded fruits, respectively. Cracks in the skin appeared independently of exposure to the sun. An increase in the concentration of the cell sap on dry, sunny days created conditions favouring a rise in water absorption during subsequent wet weather. This helps to explain why misty autumn days with heavy dew are conducive to skin cracking in ripening plums. Counter measures suggested are breeding, early picking and irrigation.

Spraying to regulate cropping.

3352. RICHARDS, R. R.

First quality and off-year yield improved with hormone and dinitro cresol sprays.

Tasm. J. Agric., 1959, 30: 353-9, bibl. 5.

DNOC applied at full bloom was compared with NAA plus glycerine applied at full bloom or 2-4 weeks later as a blossom thinning spray. On Sturmer and Delicious DNOC caused drastic blossom thinning as well as severe scorching. Increased blossom cluster formation on Sturmer was noted in the year following the application of NAA 3-4 weeks after full bloom. The application of NAA to Delicious at full bloom did not increase the following year's crop, and with this variety an application 2 weeks after bloom appeared to offer the best means of crop regulation. Variations in response with variety, tree size, vigour, age and environmental conditions preclude definite recommendations at this stage.

3353. HARLEY, C. P., AND REGEIMBAL, L. O.

Comparative effectiveness of naphthalene-acetic acid and naphthylacetamide sprays for fruit thinning York Imperial apples and initiating blossom buds on Delicious apple trees.

Proc. Amer. Soc. hort. Sci., 1959, 74: 64-6, bibl. 1.

NAA and NAamide were compared in fruit-thinning sprays, with and without the surfactant Tween 20, applied 18 days after full bloom. Fruit-set reduction in York Imperial was the same

with 25 p.p.m. NAamide as with 5 p.p.m. NAA. When Tween 20 was included in the sprays thinning was ideal. Subsequent bloom the following year, supposedly the "off-year", was more than sufficient for a full crop on all sprayed trees, while the unsprayed trees were almost devoid of blossoms. When the partial defoliation method was used on the Delicious variety in the "off-year", more blossom buds were initiated on branches sprayed with NAA than on unsprayed ones. [From authors' summary.]—Agric. Res. Serv., U.S.D.A., Beltsville, Md.

3354. SCHUMACHER, R.

Chemische Frucht-Ausdünnung zur Bekämpfung der Alternanz. (**Chemical fruit thinning for the control of biennial bearing.**)

Schweiz. Z. Obst- u. Weinb., 1960, 69: 186-90, illus.

Preliminary data obtained in 1958 with spindle bushes of Golden Delicious apples are tabulated for three methods of fruit thinning: (1) by hand; (2) by α -NAA (Dirigol) and (3) by Shellestone. Both chemical treatments have given promising results.—Eidg. Versuchsanst., Wädenswil.

3355. FRIEDRICHS, W.

Observations sur la rupture de l'alternance de la fructification de Golden Delicious par l'application d'un traitement chimique. (**Observations on breaking the biennial bearing rhythm of Golden Delicious apples by chemical treatment.**)

Rev. hort. suisse, 1960, 33: 85-6, bibl. 1, illus.

Trees that had been thinned by NAA at petal-fall in 1958, an on-year, bore normal crops in 1959, but trees on which the fruitlets had been thinned 2-3 weeks after petal-fall and also the unthinned trees did not fruit in the following off-year. Hence early thinning is considered essential to break the biennial bearing rhythm.

3356. SÄKÖ, J.

Kemiallisen raakileenharvennuksen vaikutus Wealthy-omenapuiden jaksoittaissatoisuuteen. (**The effect of chemical thinning on the biennial bearing of Wealthy apples.**) [English summary 10 lines.]

Valt. Maatalousk. Tiedon. 240, 1959, pp. 7, bibl. 8.

The application of 5 p.p.m. NaNAA + 0.125% Tween 20, 12 days after full bloom, to the biennial variety Wealthy resulted in good thinning and good fruit size. The treatment also improved yields in the following off-year, the treated trees producing 24 kg. per tree compared with only 2.9 kg. per tree in the controls.—Agric. Res. Centre, Piikkiö, Finland.

3357. EDGERTON, L. J., AND HAESELER, C. W.

Some factors influencing the absorption of naphthaleneacetic acid and naphthaleneacetamide by apple leaves.

Proc. Amer. Soc. hort. Sci., 1959, 74: 54-60, bibl. 9.

Tests were conducted to determine the influence of certain climatic conditions and surfactants on the absorption of naphthaleneacetic acid (NAA) and naphthaleneacetamide (NAD) by apple leaves. Leaves pre-conditioned under high light intensity did not absorb either material as rapidly as leaves pre-conditioned under low light intensity. Temperature exerted a marked influence on the rate of absorption. Temperatures of 50 and 55° F. tended to depress the absorption of NAD slightly more than that of NAA. At temperatures of 70 and 80° NAD was absorbed as rapidly by leaves as was NAA. Baldwin leaves absorbed slightly more NAA and NAD in 90 minutes than comparable leaves of Golden Delicious. The data suggest that the absorption of these materials by apple leaves may be rather rapid, with significant amounts absorbed in 30 minutes under favourable conditions. The addition of Tween 20 increased the rate of absorption of both NAA and NAD. [From authors' summary.]—Cornell Univ., Ithaca, N.Y.

3358. HAESELER, C. W., AND EDGERTON, L. J.

The biological activity of naphthaleneacetic acid and naphthaleneacetamide.

Proc. Amer. Soc. hort. Sci., 1959, 74: 61-3, bibl. 5.

The differences in absorption by apple leaves between NAA and NAD [see preceding abstract] were insufficient to account for the differences in biological response when these compounds were applied as thinning agents [see *H.A.*, 26: 198]. Tests with *avena coleoptiles* showed that NAA was biologically much more active than NAD. NAA solutions showed maximum biological activity at 0.08 p.p.m., inducing coleoptile sections to grow to 147.5% of their initial length, whereas NAD solutions showed maximum activity at 10 p.p.m., inducing 135.0% growth. This difference in activity may be primarily responsible for the differences in response to NAA and NAD as fruit thinning agents.—Cornell Univ., Ithaca, N.Y.

3359. URIU, K., AND LILLELAND, O.

Limb circumference measurements as an aid in the better evaluation of apple fruit thinning data.

Proc. Amer. Soc. hort. Sci., 1959, 74: 67-71, bibl. 12.

The data from apple spray-thinning experiments were expressed on the basis of "number of fruits per cm. circumference of the experimental limbs" and compared with the same data expressed on the basis of "number of fruits per 100 blossoming

clusters". In the first year the two methods of data expression were equally good in evaluating the results, because the treatments were applied on trees of uniform bloom density. In the second year, however, when the return bloom was not uniform owing to the previous year's spray-thinning treatments, the results expressed on the basis of the number of fruits per 100 blossoming clusters gave a misleading conception of the fruit set and the final crop. On the other hand, the same data expressed on the basis of the number of fruits per cm. limb circumference gave a significant indication of the amount of fruit set and the size of crop. This latter method also can be used to express numerically the density of bloom. [Authors' summary.]—Univ. Calif., Davis.

3360. CRIPPS, J.

"Stop-drop" sprays for Jonathan apples.

J. Agric. W. Aust., 1959, **8**: 563-5, illus.

Recommendations made, based on experimental work at the Stoneville Research Station, include 2 sprays of NAA at 10 p.p.m. at a 14-day interval for fruit to be cold stored or exported, or 1 spray of 2,4,5-TP at 25 p.p.m. 30 days before harvest for fruit marketed locally early in the season, and at 10 p.p.m. for later local marketing. The addition of a spreader is advised.

3361. HARRISON, T. B.

Seasonal influences on peach-thinning effectiveness of N-1-naphthyl phthalamic acid sprays.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 154-8, bibl. 6, illus.

A thinning effect was obtained in 3 seasons out of 4 by NPA sprays applied to peach trees within 7 days after full bloom. In one year sprays applied 7 days after full bloom were more effective than those applied a week later. NPA sprays did not cause any permanent injury to tree, foliage or fruit in any of the 4 seasons. Sprays sometimes caused epinasty of foliage, but this was not always associated with eventual fruit thinning. Seasonal conditions in 1958, when NPA sprays did not reduce fruit set, were somewhat cooler, brighter and more conducive to rapid drying than conditions in the 3 seasons when fruit set was reduced. Very effective thinning, however, was obtained in 1957, when conditions did not differ markedly from those in 1958 except that sunshine was less. The possible advantage of spraying in the early morning and late evening during bright, dry seasons is considered worthy of investigation.—Harlow Res. Stat., Ont.

3362. KEMP, W. S., AND WILSON, D. W.

Hormone application to apricots and peaches.
N.Z. J. Agric., 1959, **99**: 353-9, bibl. 10, illus.

See *H.A.*, 30: 252.

3363. CATLIN, P. B., AND MAXIE, E. C.

Some relationships between growth, respiration and 2,4,5-trichlorophenoxyacetic acid treatment in developing apricot fruits.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 159-73, bibl. 35.

The triethylamine salt of 2,4,5-T, sprayed on Tilton apricots when the apex of the endocarp had started to harden, reduced the respiration rate of the fruit 24 hours after picking. The results are presented graphically.—Univ. Calif., Davis.

3364. CATLIN, P. B.

Changes in some B vitamins associated with the responses of the Tilton apricot fruit to 2,4,5-trichlorophenoxyacetic acid.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 174-83, bibl. 27.

The concentrations of niacin, pantothenic acid and biotin were significantly increased within a few days of treatment with 2,4,5-T. There was no difference in thiamine content between treated and untreated fruits until after considerable differences in growth had occurred, at which time the concentration of thiamine was lower in the treated fruits than in the controls. The relationship between the higher levels of these vitamins and the increased rates of growth and respiration induced by 2,4,5-T is discussed.—Univ. Calif., Davis.

Fruit composition.

(See also 3387-3389.)

3365. GARNAGA, K. S.

The growth and premature drop of apples in relation to the concentration of phosphorus compounds in the fruit. (Ukrainian, with German and Russian summaries 10 lines each.)

J. Bot. Acad. Sci. Ukr., 1959, **26**(2): 26-9, bibl. 11.

In a study of White Calville apples it was shown that the larger the fruit, the greater the quantity of nucleoproteids it contains, and the lower the quantity of the other organic phosphorus compounds per unit of weight of fruit. The content of mineral and total P remains practically unchanged during the growth of the fruit. It was also found that small fruits which drop contain relatively much less water than the medium-sized and large fruits which remain attached to the tree.

3366. DAYTON, D. F.

Red color distribution in apple skin.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 72-81, bibl. 10, illus.

A study of the cellular distribution of anthocyanin pigment in 19 varieties.

3367. STASAUŠKAITĖ, —.

Askorbinės rūgšties pasiskirstymas ir dinamika kai kurių obelių veislių vaisiuose. (**The distribution and metabolism of ascorbic acid in some apple varieties.**) [Lithuanian, with Russian summary 1½ p.] *Darb. Akad. Moks. LietTSR Ser. B*, 1958, 2(15): 253-66, bibl. 20.

Experiments with 5 apple varieties showed that the skin contained more vitamins and 2-6 times more ascorbic acid than the flesh of the seeds. The part of the fruit exposed to the sun also contained more ascorbic acid than the shaded part. In all the varieties examined except Antonovka the ascorbic acid content decreased as fruit growth proceeded.

3368. BUJANOVSKIJ D. S., AND ČIKALOVA, E. A.

The biosynthesis of ascorbic acid in fruits in response to wounding. [Russian.] *Bot. Žurnal*, 1959, 44: 1324-8, bibl. 15.

Determinations of the ascorbic acid content were made on small segments cut from growing apples, and, 1-2 days later, on further segments cut from the same fruits near the previous wound and also on the opposite side. The ascorbic acid content was higher in the second samples, especially in the distant segments. In the lower temperatures prevailing at the end of the growth period the accumulation of ascorbic acid in the wounded tissue slowed down, and during storage the ascorbic acid content fell to slightly below that of intact fruit.

3369. TOMASZEWSKA, E., AND TOMASZEWSKI, M.

Chemiczna charakterystyka owoców kilkunastu odmian czereśni i wiśni. (**Results of chemical analyses of the fruits of certain varieties of sweet and sour cherries.**) [English and Russian summaries ½ p. each.] *Arbor. Kónnickie*, 1959, 4: 277-84, bibl. 16.

The physical and chemical characteristics of the fruits of 3 sweet cherry varieties and 15 sour cherry varieties are tabulated. Vitamin C was highest in the sour cherry Rogneda, averaging 23.6 mg. %.

3370. HOUGH L., AND PRIDHAM, J. B.

The composition of plum gums. *Biochem. J.*, 1959, 73: 550-9, bibl. 45.

The gum exuded on the fruit surface of Victoria plums contained D-galactose, D-mannose, L-arabinose, D-xylose, L-rhamnose, glucuronic acid and probably traces of 4-O-methyl-glucuronic acid. The bark gum had a similar composition but higher proportions of D-mannose, L-arabinose and hexuronic acid. In the crude state both the fruit surface and bark gums contained the enzyme peroxidase, phenolic compounds, a lignin-like substance and some inorganic materials. The formation of gums could not always be attributed

to mechanical injury or to the presence of micro-organisms.—Univ. Bristol and Roy. Holloway Coll., Univ. London.

Harvesting, packing and marketing.

(See also 3225, 3227, 4349.)

3371. GASTON, H. P., LEVIN, J. H., AND HEDDEN, S. L.

Blueberries, plums and cherries can be harvested with machines.

Amer. Fruit Gr., 1960, 80(4): 14-15, 59, illus.

A vibrator can separate blueberries from the bush 5-10 times as fast as hand picking but tends to include immature berries. A hydraulically operated shaker removed 95% of the cherry crop and was also effective for plums.—Mich. St. Univ., and U.S.D.A.

3372. ANON.

Verbeterde fruitsorteermachine. (**An improved fruit grader.**)

Fruittelct, 1960, 50: 298, illus.

A new small grader, the Greefa A3, is described, which allows apples, etc., to be graded for quality and size at the same time.

3373. NYHLÉN, Å.

Wellpapp som fruktemballage—några erfarenheter. (**Corrugated cardboard as a material for packing fruit—some observations.**)

Sver. pomol. Fören. Årsskr. 1959, 1960, 60: 25-30.

Under normal conditions it proved as good as wooden boxes.

3374. SHADBURNE, R. A.

Better loading methods improve truck shipments of apples.

Agric. Mktg., 1959, 4(10): 10, illus.

Damage in transit and loss of quality through overheating can be minimised by preventing the load shifting, avoiding the use of different sized cases in one load, and arranging stacks and battens to ensure good air circulation.

3375. POWELL, J. V., AND HANES, J. K.

Costs of marketing Appalachian apples.

Mktg Res. Rep. U.S. Dep. Agric. 300, 1959, pp. 24, illus.

Analysed data on packinghouse labour requirements and costs, materials, etc., from 7 large grower-packers over the 1957-58 season.

3376. SOMMER, N. F., AND MITCHELL, F. G.

Fruit shrivel control in peaches and nectarines.

Proc. Amer. Soc. hort. Sci., 1959, 74: 199-205, bibl. 9, illus.

Methods of reducing peach and nectarine shrivel

during transit and marketing were investigated. Hydrocooling did not result in less fruit shrivel than rapid air cooling. Water is absorbed during hydrocooling, but only a long soaking period affects fruit weight materially at the end of the period required for transit and marketing. Polythene film box liners controlled shrivel regardless of the cooling method. Brown rot decay losses, however, prevent the use of such film without an accompanying fungicidal treatment. Sodium orthophenylphenate appeared suitable for this purpose. [Authors' summary.]—Univ. Calif., Davis.

3377. DiMARCO, G. R.

A study of the control of post-harvest decays of strawberries and peaches.

Diss. Abstr., 1959, 20: 1951, being *L.C. Card No. Mic.* 59-3572 of 115 pp.

Essentially the same results as in *H.A.*, 27: 2291 and 3288.

3378. EUROPEAN PRODUCTIVITY AGENCY.

Trial shipments for European standardization of plums.

Documentation in Food and Agriculture, 1959, Series 6, being Proj. 5/16 EPA, OECC, pp. 35, illus.

A detailed account is given of the journey of 2 consignments of plums (damsons) sent from Yugoslavia, the first by lorry to Munich and the second by train to Paris, of the state in which they reached the market, and of their fate there. They were sent in accordance with Yugoslav standards. These standards are tested and compared with those recommended by the Economic Commission for Europe for dessert plums. Recommendations based on experience with these two consignments are that the standards set up by the ECE are preferable, and should be capable of being observed without difficulty by Yugoslav consignors. Rail transport appears preferable to that by lorry but needs speeding up. Other technical points concerned with packing, labelling and marking are made, and it is suggested that, as regards handling, the use of pallets might well be advantageous.

Storage.

(See also 3223, 4608, 4623, 4629.)

3379. HICKS, E. W.

The design and operation of cool stores for fruit.

Food Pres. Quart., 1959, 19: 50-3.

Thermal conductivity, mechanical strength, water absorbing capacity and cost are factors to be considered in selecting insulating materials. Natural circulation cooling systems are simple and easy to control but will not cool large stacks of fruit quickly. The main disadvantage of forced cir-

culation systems, namely unequal temperature distribution, has been overcome in modern stores by periodically reversing the direction of air flow.—C.S.I.R.O., Homebush, N.S.W.

3380. MARINO, A.

I frigoriferi rurali. Prodotti ortofrutticoli di più facile conservazione; temperatura e grado igrometrico delle celle frigorifere. (Rural cold stores. Easily stored fruits and vegetables; temperature and humidity in cold-storage chambers.)

Frutticoltura, 1960, 22: 43-7, illus.

Suitable conditions and maximum duration of storage are tabulated for 32 fruits and vegetables. [For previous sections in the series, see *H.A.*, 30: 1760.]

3381. TURNER, J. N.

Control of fungal diseases of fruit in storage.
Outlook on Agric., 1959, 2: 229-37, bibl. 26, illus.

Diseases of temperate and tropical fruits listed and control measures discussed.

3382. HILKENBÄUMER, F., AND OTHERS.

Gesichtspunkte bei der Lagerung von Kernobst. (Points to consider in the storage of pome fruits.)

[Publ.] *Bundesminist. Ernähr., Landw. u. Forsten, Bonn*, [1959?], pp. 63, bibls, illus.

This booklet contains the following 6 articles: The effect of environmental conditions on the storage of pome fruit (pp. 5-10), by F. Hilkenbäumer. The behaviour of the more important variety groups of the Federal variety list (apples and pears) in relation to origin, pre-storage treatment, humidity and temperature, including ventilation (pp. 11-29, bibl. 14, illus.), by N. Nicolaisen. Experiments and observations on air scrubbing (pp. 30-6, illus.), by P. G. de Haas. The behaviour of some important apple and pear varieties in gas storage (pp. 37-45), by E. Loewel. Incidence and causes of internal fruit browning in different varieties of pome fruit and under different storage conditions (pp. 46-58, bibl. 12, illus.), by J. Wolf. Incidence and causes of scald in different varieties and under different storage conditions (pp. 59-63), by G. Buchloh.

3383. MATTUS, G. E., AND ROLLINS, H. A., JR.

The cold storage of Virginian apples.

Circ. Va Polytech. Inst. 841, 1959, pp. 2.

Most varieties stored best at 30-32° F. and 85-90% R.H.; gas storage showed little advantage.

3384. ANON.

Apple storage.

Report, Purdue Univ., 1959, 2(3): 9.

Storage in sealed polythene liners suited Golden

Delicious, Jonathan, Rome Beauty, Gallia Beauty and Staymared. Liners of 1.5 mil. thick film of density 0.914, well sealed at the top and bottom, are recommended. Difficulties were encountered with Grimes Golden, Red Delicious, Turley, Winesap and McIntosh.

3385. PORRITT, S. W., AND FISHER, D. V.
Effect of maturity and postharvest treatment on color, firmness and flavor of Gold Delicious apples.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 113-20, bibl. 6.

See *H.A.*, 28: 169.

3386. BÜNEMANN, O.
Über Beziehungen zwischen Qualität und Haltbarkeit von Äpfeln in Abhängigkeit vom Mineralstoffgehalt des Bodens und der Blätter. I. (The relationship between the harvest quality and the keeping quality of apples in relation to the mineral content of the soil and the leaves. I.) [English and French summaries $\frac{3}{4}$ p. each.]

Gartenbauwiss., 1959, **24**: 177-201, bibl. 29.

Regardless of varietal differences, the following general relationships were found between fruit characteristics at harvest time: Increased size resulted in decreased firmness but in increased dry matter (or soluble solids) content and red colour development. Dry matter, acidity and firmness were positively correlated with each other. With increasing dry matter content the stage of maturity (ground colour) was advanced, and the roughness of the skin and acceptability of the juice were increased. The negative correlation between red colour development and firmness was attributed to a secondary effect of the fruit size. Highly significant correlations existed between analyses and observations at harvest and the score values of changes occurring during cold storage. Rough skin caused higher weight losses, more decay and more shrivelling during storage. The effect of size was less pronounced in this respect, but it clearly caused a reduction of firmness. Red colour was positively correlated with flavour and was associated with decreased physiological troubles. The correlations of dry matter content, fruit size and ground colour with the score values allotted to other fruit characteristics during storage were the same as with the absolute values at harvest. Predicting the keeping quality of fruit seems to be possible within certain limits. [From author's summary.] The investigation was carried out in 1955/56 and 1956/57 on the varieties Cox's Orange Pippin, Gold Pearmain and Boskoop. The apples were growing in 84 and 198 different orchard plots, respectively.—Inst. Obstb. Baumsch. tech. Hochsch. Hannover.

3387. HILKENBÄUMER, F., BUCHLOH, G., AND ZACHARIAE, A.
Beobachtungen über Veränderungen der Titrationsazidität in Äpfeln während der Lagerung bei verschiedenen Temperaturen. (Observations on changes in titratable acidity in apples during storage at different temperatures.) [English and French summaries 12 lines each.]

Gartenbauwiss., 1959, **24**: 1-7, bibl. 6.

Observations were made on the metabolism of protein (total, free and protein N), amino acids and some acids of the tricarboxylic acid cycle in Ontario, Cox's Orange Pippin, Golden Delicious and Jonathan apples held at +4°, +2°, 0° and -2° C. The most important findings were a striking inhibition of the protein synthesis, a distinct increase in aspartic acid and a decrease in malic acid in apples suffering from low temperature breakdown. The theory is advanced that the loss of malic acid under such circumstances depends not only on decarboxylation to pyruvic acid but also on transformation to aspartic acid.

3388. ARASIMOVICH, V. V.
Transformation of carbohydrates in apples during prolonged storage. [Russian.]
Biohim. Plod. i Ovošč., 1958, No. 4, pp. 73-87, bibl. 15.

It has been established that there is a connection between the rate of transformation of the pectic substances and the storage quality of apples. After harvest, when the rate of respiration increases, the activity of the pectolytic enzymes continues and an increased hydrolysis of the pectic substances occurs. The initial period of storage is characterized by the greatest loss in fruit weight; this decreases gradually with time. A considerable quantity of water is released during hydrolysis of the pectic substances, which is used in respiration and in the formation of monosaccharides. The double role of the pectic substances, i.e., as structural elements of the fruit tissues and as substances used in metabolic processes, is of special interest, as it appears to be a most important factor affecting the keeping quality of apples.

3389. SAPOŽNIKOVA, E. V.
Biochemical studies on the ripening and storage of apples and the ripening of plums. [Russian.]
Biohim. Plod. i Ovošč., 1958, No. 4, pp. 88-111, bibl. 28.

Accumulation of starch and sugars occurs considerably more rapidly in the late autumn varieties of apple than in the winter varieties. The transformation of protopectin into soluble pectin is much slower in winter varieties, which keep longer than earlier ones. In varieties which store well enzyme activity is low, whereas in non-keeping

varieties protopectinase and pectinesterase activities are high.

3390. MEZZETTI, A.

Sulla diagnosi differenziale fra disfacimento interno primario e disfacimento interno conseguente a congelamento delle mele. Proposta di un nuovo metodo. (**Differential diagnosis between primary internal breakdown of apples and that caused by freezing. Proposal of a new method.**)

Frutticoltura, 1960, 22: 71-8, bibl. 19, illus.

Examination of the individual stored fruits gives little or no indication of whether freezing was the cause of breakdown. The proposed new criterion is the distribution of damaged fruits in the stack of boxes in the storage chamber. In primary breakdown their distribution will be irregular, but in frost damaged fruit there will be distinct gradients of intensity of breakdown, with maxima near the mouths of cold-air ducts or near frost pockets caused by faulty insulation of the floor, wall or ceiling.

3391. OKAMOTO, T.

Studies on apple scald. Part II. Analysis of volatiles and catecholase activities of apple skin suffering from scald-like injury. [Japanese, with English summary 8 lines.]

Bull. Fac. Agric. Hirosaki Univ., 1959, No. 5, pp. 46-52, bibl. 19.

Formic and acetic acids, methyl alcohol, acetaldehyde and esters were identified in the brown-coloured apple skin resulting from unventilated, room-temperature storage. Comparison of the concentrations of these chemicals with the minimum external concentration of volatiles necessary to induce scald injury indicated that formic acid and esters may be the causative agents. Catecholase activity in brown skin was increased to a similar extent, in whatever way the scald was induced. [For part I, see *H.A.*, 29: 162.]

3392. WORKMAN, M., AND PATTERSON, M. E.

The value of an alkaline potassium permanganate air scrubber to reduce volatile levels in apple storage rooms and maintain apple quality.

Proc. Amer. Soc. hort. Sci., 1959, 74: 106-12, bibl. 4.

The air scrubbers tested were those described by Kuc *et al.* [*H.A.*, 24: 1229 and 1230], modified by the installation of larger and more efficient liquid circulating pumps. Their use did not result in any reduction in the level of volatiles in cold stores containing apples, nor was there any reduction in apple scald or delay in the softening of the fruit. This failure is attributed to the rapid neutralization of the base component (sodium hydroxide) of the permanganate solution.—Purdue Univ., Lafayette, Ind.

3393. TERUI, M.

Diseases of apples in storage. [Japanese, with 1952-56.] [English summary 1½ pp.]

Bull. Fac. Agric. Hirosaki Univ., 1959, No. 5, pp. 58-62, bibl. 13, illus.

Nine fungal diseases and 6 physiological disorders listed.

3394. NYHLÉN, Å.

Kyllagring av olika äppelsorter 1952-1956. (**The cold storage of several apple varieties 1952-56.**) [English summary 1½ pp.]

Sver. pomol. Fören. Årsskr., 1959, 1960, 60: 91-110, bibl. 8.

Apples of 5 varieties—Cox's Orange Pippin, Cox's Pomona, Ribston, Ingrid Marie and Laxton's Superb—from 9 different regions were stored at 2-5° C. The weight loss of Cox's Pomona was lower than that of the other varieties, presumably because of its waxy skin. Bitter rot (*Gloeosporium* sp.) was responsible for most of the fruit wastage, the severity of the disease varying from district to district and from year to year. When N and K were applied generously, the percentage of apples affected with bitter rot was significantly greater at high than at low levels of P. Heavy applications of K, on the other hand, were conducive to high yields. This observation led growers to use more K, which in turn increased the susceptibility of the fruit to gloeosporium infection. Bitter pit occurred in three varieties. It appears that this trouble is also aggravated by high levels of K and N. It is suggested that the fungal and physiological diseases described in this paper are partly due to an imbalance between N, K and P.

3395. BROOK, P. J.

Lenticel spot, bitter rot and ripe spot of apples.

Orchard. N.Z., 1960, 33: 20-9, illus.

To control lenticel spot, the cause of which is not fully understood, harvesting at export maturity is advised. Bitter rot (*Glomerella cingulata*) responded to captan, thiram and ziram in glasshouse tests, but bordeaux, 2 : 6 : 100 plus casein sticker at 4 oz./100 gal., gave the best field control, 6 applications being given from 18 December to 10 March. Ripe spot (*Neofabraea perennans* and *Gloeosporium album*) in store was greatly reduced by giving 6 applications of phenyl mercury chloride 2.5% w.p. at 2 lb./100 gal. from green tip (25 Sept.) until 18 December and 5 applications of captan 50% w.p. at 2 lb./100 gal. from 9 January until 1 April. Cold storage also reduced the incidence of ripe spot.—D.S.I.R., N.Z.

3396. ANON.

Lime sulphur, concentrate sprayers and ripe spot.

Tasm. J. Agric., 1959, 30: 246.

Ripe spot of apples cannot be controlled with lime

sulphur, but thiram or captan applied regularly during October and November (spring) will reduce the incidence of the disease, provided the fruit is picked as soon as it is sufficiently mature for cool storage and shipment.

3397. WILKINSON, B. G.

Apples which should not be stored.

Grower, 1960, **53**: 588-9, illus.

Some ways of reducing bitter pit are suggested. Where irrigation is practised it should be regularly spaced with no late and heavy watering. Picking should be delayed, especially from vigorous and young trees, with small crops being picked last. If possible large fruit, especially from small crops, should not be stored, but if storage is necessary the fruit should be segregated and disposed of early. No fruit already showing bitter pit should be stored.—Ditton Lab., Kent.

3398. PRATELLA, G. C.

Prove orientative sulla conservabilità della "Max Red Bartlett" in frigorifero. (Preliminary cold storage trials on Max Red Bartlett pears.)

Riv. Ortoflorofruttic. ital., 1959, **43**: 491-7, illus.

In one year's trials fruit was picked on 13, 20 and 27 August when the resistance of the pulp, as gauged by a cylindrical penetrometer 0.8 cm. in diameter, was 8.480, 8.220 and 6.280 kg., respectively. The last picking date was the best, the fruit showing perfectly normal maturation after 128 days' cold storage and ripening in 5-6 days.—Ist. Pat. veg., Univ. Bologna.

3399. KAUKO, Y.

Über die Frischhaltung von Früchten. (On the storage of fresh fruit.)

Naturwissenschaften, 1959, **46**: 208-9.

Certain preservatives, such as ether, alcohol and formic acid, added to closed packages at the rate of about 0.02 mol./kg. kept peaches fresh for over 3 weeks (at 30-40° C.) and persimmons for over 7 days. Vapour pressure and rate of diffusion were a function of the storage temperature. It is believed that the principles of storage used in these experiments are applicable also to a number of other fruits.

SMALL FRUITS, VINES AND NUTS.

Strawberries.

(See also 3085, 3114, 3223, 3224, 3323, 3377, 3426, 3705, 3728, 4625, 4629-4631.)

3400. KOLBE, M. H., WELLS, J. C., AND SCOTT, H. E.

Commercial strawberry production.

Ext. Circ. N.C. agric. Ext. Serv. **422**, 1959, pp. 16, illus.

Planting, nutrition, weed and frost control, picking and packing, and detailed recommendations for insect and disease control in North Carolina.

3401. INFANTE, J. S.

El cultivo de la fresa. (Strawberry growing.) *Rev. nac. Agric., C.R.*, 1957, **51**(627): 29-31, reprinted in *Suelo Tico*, 1959, **11**(43): 19-22.

Recommendations for Costa Rica.

3402. HABRAN, R.

Culture du fraisier à gros fruits. (The cultivation of large-fruited strawberries.)

Pomol. franç., 1960, **2**(2): 11-14.

Cultural methods and description of 9 varieties.

3403. SCOTT, D. H.

Size, firmness, and time of ripening of fruit of seedlings of *Fragaria virginiana* Duch. crossed with cultivated strawberry varieties.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 388-93, bibl. 7.

A breeding study.

3404. BRINGHURST, R. S., AND VOTH, V.

Larger strawberries through plant breeding.

Calif. Agric., 1960, **14**(2): 8, illus.

Large-fruited hybrids between native S. American *F. chilensis* and commercial varieties.

3405. REID, R. D., AND MONTGOMERIE, I. G.

Some problems in breeding strawberries resistant to red core disease (*Phytophthora fragariae* Hickman).

From abstr. in *Heredity*, 1960, **14**: 222.

3406. KLUGE, K.

Das Verhalten der diploiden Form von *Fragaria vesca* var. *semperflorens* im Vergleich mit der tetraploiden Form hinsichtlich Blüte und Scheinfrucht. (The behaviour of the diploid form of *Fragaria vesca* var. *semperflorens* as compared with the tetraploid form in respect of flowers and fruit.) [Russian and English summaries 23 and 20 lines.]

Arch. Gartenb., 1959, **7**: 589-606, bibl. 25, illus.

A comparison of the diploid and the colchicine-induced tetraploid types of *Fragaria vesca* var. *semperflorens* showed the following differences: (1) Tetraploids formed fewer inflorescences per plant and accordingly had fewer flowers. (2) Tetraploids had bigger flowers with the same number of petals but fewer anthers. (3) Tetraploids produced fewer pollen grains, and these had such low

viability that uniform and adequate pollination was impossible. (4) Seed weight was twice as high in tetraploids as in diploids, but the viability of the former was low (20–30%). The number of seeds per fruit amounted to about 100 in diploids and to 30–40 in tetraploids. (5) the fruits of tetraploids were often deformed and they were smaller than those of diploids. In tetraploids there were also fewer fruits per plant.—Inst. Obstb. landw.-gartner. Fak., Humboldt Univ., Berlin.

3407. STAUDT, G.

Eine spontan aufgetretene Grossmutation bei *Fragaria vesca* L. (A spontaneous major mutation in *Fragaria vesca*.)

Naturwissenschaften, 1959, 46: 23-4, bibl. 2, illus.

The mutants described do not form a rosette but have long internodes. The average height of 18 plants after 19 months was 87 cm.—Max-Planck-Inst. f. Züchtungsforsch., Köln-Vogelsang.

3408. SCHUPPE, E.

Ergebnisse von Wertprüfungen mit einmaltragenden Erdbeersorten. (The evaluation of summer-fruited strawberry varieties.) *ErwObstb.*, 1960, 2: 96-100.

Notes on variety trials carried out since 1951 in 20 localities in Germany.

3409. SLATE, G. L., AND WATSON, J.

Fletcher, Frontenac and Fulton strawberries. *Fruit Var. hort. Dig.*, 1959, 14: 35-6.

Introduced in 1959, Fletcher is excellent for freezing, Frontenac is a heavy cropper with few runners and Fulton is unusually firm.—N.Y. agric. Exp. Stat., Geneva.

3410. BROOKS, A. N.

Strawberry Investigations Laboratory.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 394-6.

Gibberellic acid is being tested to determine whether it would hasten fruit bud formation in autumn-planted strawberries. Black polythene mulch preserved soil moisture thereby increasing vigour, significantly increased yields, advanced ripening by 6 days, prevented soil rots on the fruit, and suppressed weeds. *Weed control*: Vapam injected 6 in. deep into the centre of a 2-row bed at 1 pt. per 100 lineal ft. 2 weeks before planting in the autumn gave good control of weeds between the rows, but the rows themselves and sides of the beds were weedy. *Two-spotted spider mite* (*Tetranychus telarius*) was controlled by 2% Kelthane dust applied at 3-week intervals. *Sclerotium rolfsii* was killed, and many plants survived a heavy infestation, when Terraclor 75% w.p. at 34 lb./340 gal./acre was sprayed in the affected areas and over a 20-ft. surrounding band.

3411. SIRONVAL, C., AND EL TANNIR-LOMBA, J.

Vitamin E and flowering of *Fragaria vesca* L. var. *semperflorens* Duch.

Nature, 1960, 185: 855-6, bibl. 3.

Investigations were made into the relationship between day-length, the vitamin E content of the leaves and flowering. The content of vitamin E per 100 mg. of the unsaponifiable fraction was found to be almost twice as high in long days as in short days. Plants transferred from long to short days showed diminished flowering intensity, and the content of vitamin E of the adult leaves dropped to about half within 2 months. Observations on plants in the field also showed that the vitamin E content was low at the beginning of spring, rose rapidly until June and then fell, the trend thus corresponding to day-length. This seasonal variation was most evident in young leaves. This supports the suggestion that vitamin E plays a part in the promotion of flowering.—Univ. Liège.

3412. IL'INSKIY, A. A.

Fruit bud formation in hybrid strawberry seedlings under different day-lengths. [Russian, with English summary $\frac{1}{2}$ p.]

Izv. Akad. Nauk S.S.S.R., Ser. biol., 1960, 25: 138-46, bibl. 18, illus.

Whereas under long-day conditions (14–16 hr.) fruit buds were formed on only 2.9% of the hybrid strawberry seedlings, under short-day conditions (10 hr.) 91% of the seedlings formed fruit buds by the end of August. The duration of fruit bud formation, seldom exceeding 1 month in clonal varieties, lasted more than 5 months in the hybrids. In the hybrid progeny of 2 early varieties fruit bud initiation began much earlier than in the progeny of 2 late varieties. Morphological characters had no influence on fruit bud initiation. Five phases of fruit bud formation are distinguished and illustrated.

3413. V.D. MUIJZENBERG, E. W. B.

Ganzjahresproduktion von Erdbeeren. (Strawberry production throughout the year.) *ErwObstb.*, 1960, 2: 86-9, illus.

By means of photoperiodic treatment.

3414. KRONENBERG, H. G., BRAAK, J. P., AND ZEILINGA, A. E.

Poor fruit setting in strawberries. II. Malformed fruits in Jucunda.

Euphytica, 1959, 8: 245-51, bibl. 4, illus.

In preliminary field experiments in various localities it was found that raw weather increased the percentage of malformed fruits (nubbins) in Jucunda, especially in clone JK3. Interplanting with Deutsch Evern, a good pollinator, decreased the percentage of nubbins. Insufficient pollination occurred in the centre of very closely planted beds. Bees did not improve fruit setting. The anthers of

Jucunda are often poorly developed, and the percentage of morphologically good pollen of the bad clone JK3 was sometimes lower than that of the better clones of Jucunda. In growth chamber experiments it was found that good fruit setting in Jucunda only occurred in the temperature range of 17–26° C., and that at 14° C. and lower no set occurred. In contrast, fruit setting in Deutsch Evern was good at all temperatures in the range 10–26° C. [For part I, see *H.A.*, 29: 3339].—I.V.T., Wageningen.

3415. SCHNEIDER, K., KLUG, H. L., AND MCCRORY, S. A.

The effects of temperature and leaf sugar content on the electrical conductance of strawberry leaf exudates.

Proc. S. Dak. Acad. Sci., 1958, 1959, 37: 92-9, from *Biol. Abstr.*, Sect. D, 1960, 35, Abstr. 11,241.

During the early autumn sampling of leaves from field plants revealed that observed values of conductivity of the leaf exudates decreased among all varieties tested for a period of time. Late autumn samplings showed an increase. From a study of minimum temperatures recorded during this period it appeared that the observed decrease in conductance occurred when the temperatures were generally slightly above freezing point, and that when the plants were subjected to injurious temperatures the electrical conductance increased. Plants in the greenhouse exposed to hardening temperatures during the period of darkness had lower electrical conductance values than duplicate plants left at room temperature. Upon exposure to freezing temperatures the conductance values of both sets of plants increased considerably, but the increase was less in the plants which had previously received the cold treatment. Some varietal differences were observed in the electrical conductance values. The concentration of Na and K ions in the leaf exudates showed a definite relation to the electrical conductivity values. The concentration of both reducing and total sugars in the leaves was increased by subjecting the plants to low temperatures. In neither field nor greenhouse plants were the changes in leaf sugar content related to the observed electrical conductance of the leaf exudates.

3416. OGORODNIKOV, B. I.

Agrometeorological basis for autumn planting of strawberries in the central regions of the European Territory of the USSR. [Russian.] *Meteorol. i Gidrol.*, 1958, No. 5, pp. 40-3, from *Biol. Abstr.*, Sect. D, 1959, 34, Abstr. 14,279.

The author considers that strawberries should not be planted later than 20 to 30 days before the mean soil temperature falls below 7° C., and suggests

an indirect method of assessing this date from the difference between air and soil temperatures.

3417. GUTTRIDGE, C. G.

Cold-stored plants allow summer planting.

Grower, 1960, 53: 402-3, illus.

A continuation of the article recorded in *H.A.*, 30: 1806. After cold storage strawberry plants must be allowed to thaw out for 24 hours before planting. A spacing of 9–10 in. between plants with 3 ft. between rows has proved satisfactory for Scottish conditions. With summer planting the roots must be prevented from drying out, but with care a 95% stand has been obtained. Earliness of planting is advised, since the size of the following year's crop increases as the time of planting is advanced. No difference has been found in earliness of cropping between cold-stored and freshly dug runners.—Scot. hort. Res. Inst., Mylnfield.

3418. THOMPSON, P. A.

Maleic hydrazide could improve your yields.

Grower, 1960, 53: 535-7, illus.

Preliminary field trials in Scotland have shown that MH can be used on maiden strawberry plants to prevent runner development between the parent rows, since it has a greater effect on runner buds than on the crown. Spraying with a 0.15–0.2 solution has given almost complete runner suppression in Talisman and Vigour, the first application being given when the earliest runners are clearly visible and a second when young runners are again seen emerging. Further south additional sprays may be necessary. Until further trials have been carried out caution must be exercised in the use of MH for runner control.—Scot. hort. Res. Inst., Mylnfield.

3419. JASTREBOV, M. T.

The influence of active soil acidity on the utilization of different forms of nitrogen fertilizers and on the sugar content of the fruits in strawberry plants. [Russian.]

Vest. Mosk. Univ. Ser. biol., 1957, No. 1, pp. 153-8, bibl. 14, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,522.

At pH 5.3, and more especially at pH 4.1, the uptake of N was greater from nitrate than from ammonium N, whereas at pH 7.3 ammonium salts were absorbed more readily. In a mildly acid medium, pH 5.5, the higher absorption of nitrates induced a greater production of proteins and carbohydrates, resulting in a ripe fruit sugar percentage of 80 compared with 60 for ammoniacal N. In a weakly alkaline medium, pH 7.3–7.5, ammonium N resulted in a fruit sugar content of 62.6% as against 50.4% with nitrate N. The general level of sugar content increased with increasing soil acidity, but on a very acid soil of pH 4.3 the application of humus was required to ensure a maximum sugar percentage.

3420. KISIS, I. R.
The effect of micro-elements on the yield and quality of strawberries. [Russian, with English summary ½ p.]
Tr. Akad. Nauk LatvSSR. (Mikroelem. v Rasteniev.), 1958, 9: 257-64, bibl. 7.
 When a 0.025% solution of CuSO_4 or a mixture of B, Cu and Mn was applied to strawberry plants growing on a peaty soil, yields were increased by 12.6% and 25.7%, respectively, and the quality of the fruit was greatly improved. Strawberries on a limed peaty soil responded well to Mo fertilizers.
3421. WESTGATE, P. J., AND FORBES, R. B.
Soil management problems in vegetable crop fields.
A.R. Fla agric. Exp. Stats, 1957-58, p. 188.
 Chlorotic strawberry plants with brown stubby roots caused by the sting nematode, *Belonolaimus gracilis*, were cured by a foliar application of 1 lb. of Fe-EDTA in 100 gal. per acre. Cabbage yields were the highest from a split application of a complete fertilizer (5-5-8) at 1 ton per acre. For single applications band treatments were more effective than broadcasting.
3422. LOVE, J.
Higher fruit yields obtained by using plastic mulch.
Grower, 1960, 53: 888.
 In trials in the west of Scotland the use of 150-gauge, 50-in. wide, black plastic mulch increased the yield of Talisman strawberries from 9.4 oz. per plant on unmulched plots to 13.8 oz. per plant. The fruit from mulched plots ripened earlier and more evenly, was much cleaner and a greater proportion was of dessert grade. The method of applying the plastic and cultural treatments are briefly discussed.
3423. GINGRICH, J. R., AND HOPP, R. J.
Bigger strawberries.
Vt Fm Home Sci., 1958, 4(1): 11, 15.
 Sprinkler irrigation increased yields of Catskill strawberries most with matted rows, the densest planting system tested. Fruit size was increased but no significant effect was noted on the number of crowns and trusses per plant, the number of lowers, buds and fruits, or the fresh and dry weights of the tops and roots. The results suggest that strawberry plants grown in matted rows on sandy fine sand should receive 1 inch of water at intervals of not more than 8 days.
3424. ANDERSON, R. E., AND HARDENBURG, R. E.
Effect of various consumer baskets, film wraps, and crate liners on quality of strawberries.
Proc. Amer. Soc. hort. Sci., 1959, 74: 394-400, bibl. 4.
 Strawberries kept better for 4 days at 40° F. than for 2 days at 70°. Weight loss was least in baskets that were completely overwrapped, intermediate in those having a film cap, and highest in open-top baskets. A film cap usually reduced weight loss to one-half or less of that occurring from open-top baskets. Moisture-proof films were most effective in reducing weight loss; non-moisture-proof film was least effective. Weight loss was greatest in an open-mesh plastic consumer basket. Decay was generally slightly lower on berries in film-overwrapped baskets than in capped baskets, but was lowest in open-top baskets. Berries in baskets overwrapped with polythene showed greater amounts of decay than with any other film tested. There was little difference in the extent of decay in the various types of pint basket tested. Strawberries wrapped with film, either as caps or overwraps, were better in appearance than those in open-top baskets. The use of a semi-moisture-proof type of film cap appears more promising for maintaining the quality of consumer-packaged strawberries than other types, since it reduces moisture loss considerably and does not cause excessive condensation. Use of polythene crate liners for strawberries stored at 40° F. was not promising. With 2.0-mil. liners a high build-up of carbon dioxide and nearly complete depletion of oxygen within the liners caused the berries to ferment. With thinner gauge liners the atmosphere around the berries was not modified enough to affect the quality of the berries. [From authors' summary.]—U.S. Dep. Agric., Beltsville, Md.
- Other small fruits.*
- (See also 3085, 3114, 3236, 3343, 3623, 4286, 4604, 4631.)
3425. HINTON, W. L.
Profitable soft fruit.
Agriculture, Lond., 1960, 66: 493-9, and *Grower*, 1960, 53: 599-601 and 662-3.
 An example of how to analyse costs and how to interpret the results to aim at higher profits. The analysis has been developed from an economic survey of soft fruit holdings [see *H.A.*, 29: 3311].—Dep. agric. Econ., Wye Coll., Kent.
3426. BELGIUM. MINISTÈRE DE L'AGRICULTURE.
 Variétés de petits fruits. Fraisières, framboisiers, groseilliers. (Small-fruit varieties. Strawberries, raspberries, currants and gooseberries.)
Tract Serv. Inf. agric. Bruxelles H111, 1959, 1 folded sheet.
 Brief tabulated notes on 8 varieties of raspberry, 5 of black currant, 6 of red currant, 5 of gooseberry, and 14 of strawberry, for cultivation in Belgium.
3427. JOYCE, A. E.
Quality in soft fruit.
Sci. hort., 1960, 14: 116-25, bibl. 1.

The various aspects of quality, i.e. flavour, titratable acidity, ascorbic acid content, colour and texture, and possible ways of measuring them are discussed. Preliminary work on factors affecting the ascorbic acid content of black currants is summarized.

3428. DRIJFHOUT, E., AND GERRITSEN, C. J.
Actinidia chinensis, een nieuw fruitgewas.
(*Actinidia chinensis*, a new fruit crop.)
[English summary $\frac{1}{2}$ p.]
Meded. Dir. Tuinb., 1959, 22: 682-7, bibl. 11, illus.

Trials have recently been started on the possibility of cultivating the Chinese gooseberry under glass and in the open in the Netherlands. In either a heated or a cold glasshouse the crop has given very satisfactory results. It is easy to grow, crops heavily and is resistant to diseases; the main problems of glasshouse culture are its very prolific growth, the need for artificial pollination and whether the fruit can be sold at an economic price. The outdoor trials have not yet reached a stage at which the susceptibility of the crop to spring frosts can be determined. Cultivation practices are described.—R.T.C., Leeuwarden, and Inst. Vered. Tuinbouwgew., Wageningen.

3429. LIEGEL, W.
Der Ernteverlauf bei der Brombeersorte Theodor Reimers. (Yield curves of the blackberry variety Theodor Reimers.)
ErwObstb., 1960, 2: 74-7, bibl. 8, illus.
Tabulated data for the summers of 1958 and 1959.

3430. THORPE, G. R.
Highbush blueberry culture in British Columbia.
Hort. Circ. B.C. 84, 1959, pp. 11.
Advice is given on all aspects of culture and marketing.

3431. MOORE, J. N.
New blueberry is introduced.
N.J. Agric., 1959, 41(6): 4-5, illus.
SCOTT, D. H., AND OTHERS.
The Collins blueberry. A new variety.
Bull. N.J. agric. Exp. Stat. 792, 1960, pp. 3, illus.

Similar to Earliblue but 5-7 days later, with medium-sized, tight clusters of pale, sub-acid, well flavoured fruit.

3432. ROELOFSEN, B.
Resultaten van de proefvelden blauwe bessen in 1959. (Results in 1959 from the blueberry trial fields.)
Fruitteelt, 1960, 50: 343-4, illus.

Among other observations made it is reported that nitrogen applied as $\frac{2}{3}$ sulphate of ammonia and $\frac{1}{3}$ nitrate of ammonia in April and June gave better results than sulphate of ammonia alone.

3433. BLAZSEK, V., AND RÁCZ, G.
Über die Abwesenheit von Arbutin in den Blättern der Heidelbeere (*Vaccinium myrtillus* L.). (On the absence of arbutin from blueberry leaves.)
Naturwissenschaften, 1958, 45: 418-19, bibl. 12.

3434. WOODRUFF, R. E., AND DEWEY, D. H.
A possible harvest index for Jersey blueberries based on the sugar and acid contents of the fruit.
Quart. Bull. Mich. agric. Exp. Stat., 1959, 42: 340-9, bibl. 4.

The shelf-life of blueberries was significantly correlated with the sugar-acid ratio of the fruit when harvested. Poor holding quality was associated with high sugar-acid ratios. The soluble solid contents of the extracted juice of the fresh fruit was found to be a reliable means of quickly estimating the sugar content, and pH measurements proved reliable for ascertaining the acid content. Accordingly, a chart devised for estimating the degree of ripeness of Jersey blueberries is proposed for use as a field guide for selecting the proper time for harvesting Jersey blueberries. Degree of ripeness could be ascertained directly from the soluble solids readings obtained with a hand refractometer, and the acid content estimated from pH values determined with a portable meter. [From authors' summary.]

3435. KENDER, W. J., AND CHILDERS, N. F.
Growth of cranberry plants (*Vaccinium macrocarpon*) with various sources of nitrogen.
Proc. Amer. Soc. hort. Sci., 1959, 74: 407-13, bibl. 16, illus.

Urea, urea-formaldehyde (UF), calcium nitrate and ammonium sulphate were applied to cranberry plants growing in bog-soil cultures in the greenhouse to compare their relative value as sources of N. UF produced significantly greater runner growth and weight of plants than did ammonium sulphate or urea, and significantly greater fresh weight of plants than any of the other fertilizers. Ammonium sulphate produced the poorest plant growth. In a 2-year field experiment it was found that a single application of UF nitrogen in June gave as good results as a split application of a standard fertilizer containing ammonium nitrate at the same rate of N.—Rutgers Univ., New Brunswick, N.J.

3436. RINGEL, S. M., KAUFMAN, J., AND JAFFEE, M. J.
Refrigerated storage of cranberries.
Mktg Res. Rep. U.S. Dep. Agric. 312, 1959, pp. 17, bibl. 10.

Trials on Howes cranberries held in cold storage at 40° F. and in common storage, for varying periods up to 19 weeks, showed that cranberries cooled more rapidly in field boxes than when

prepackaged in master-cartons. Weight losses and spoilage were reduced in cold storage and the shelf life of the fruit was extended. Freshly harvested fruit, screened, or screened and prepackaged, kept for 6 weeks in cold storage without requiring a further rescreening. The amount of spoilage was also reduced by minimum handling before and after storage. The principal fungi found were *Penicillium* spp., *Acanthorhynchus vaccinii*, *Phoma* sp. and *Sporonema oxycocci*.

3437. FREEMAN, G. H., AND THOMPSON, J. A.
The assessment of wood growth on black currant bushes.
A.R. E. Malling Res. Stat. 1959, 1960, A43: 67-9, bibl. 1.

A method of measuring wood growth on black currant bushes is described. Shoots are measured to the nearest decimetre, and, for most purposes, a sample of about 10 shoots per bush is sufficient. The sampling method consists of taking every *n*th shoot, with a random starting point. More accurate results are obtained with less labour by measuring a sample on all bushes in a plot than the whole of only some, but sampling is not recommended for single-bush plots or comparisons of different varieties. [Authors' summary.]

3438. VAN HEYNINGEN, J.
Is men bij teelt van rode bessen aan hagen op de goede weg? (**Is one on the right road in growing red currants as hedges?**)
Fruitteelt, 1960, 50: 334, illus.

Young red currant bushes, rooted from long cuttings (3 ft.), were trained as "bush cordons" to wires and produced about 100 g. of fruit per bush in their first bearing year. It is suggested that the plants be allowed to reach between 6 and 9 ft. in height, and later be replaced by a strong shoot from the base when growth needs to be renewed.—R.T.C., Utrecht.

3439. REICHEL, L., STROH, H.-H., AND REICHWALD, W.
Über die Farbstoffe der schwarzen Holunderbeere. (**On the pigments of the black elderberry.**)
Naturwissenschaften, 1957, 44: 468, bibl. 4.

3440. BEAKBANE, A. B., AND LABERN, M. V.
The performance of some virus-tested loganberry clones.
A.R. E. Malling Res. Stat., 1959, 1960, A43: 48-51, bibl. 7, illus.

A trial designed to record the relative cropping capacity and other pomological characteristics of virus-tested clones of loganberry is described. Train differences occurred in vigour, method of flower insertion on the inflorescence, yield, fruit size, and susceptibility to frost damage. Clones 60/2 and 463/3 are considered to be the most promising. [Authors' summary.]

3441. WOOD, C. A.
Commercial raspberry growing: the integration of cultural factors.
Sci. Hort., 1960, 14: 97-103, illus.
A summary of results obtained at Mylnefield [see also *H.A.*, 30: 1836].

3442. AROIAN, H. B.
Raspberries and blackberries for Virginia.
Circ. Va Polytech. Inst. 839, 1959, pp. 3.
Varieties are recommended and methods of cultivation outlined.

3443. HASKELL, G.
Role of the male parent in crosses involving apomictic *Rubus* species.
Heredity, 1960, 14: 101-13, bibl. 10, illus.

3444. NYBOM, N.
Hallonodlingens virusproblem—sett ur växtförelingspunkt. (**The virus problem in raspberries from the point of view of the plant breeder.**) [English summary 1 p.]
Sver. pomol. Fören. Årsskr. 1959, 1960, 60: 47-60, bibl. 9, illus.

Breeding for resistance to the aphid vector *Amphorophora rubi* has been started at Balsgård.

3445. KNIGHT, R. L., AND KEEP, E.
The genetics of suckering and tip rooting in the raspberry.
A.R. E. Malling Res. Stat. 1959, 1960, A43: 57-62, bibl. 11.

The transfer of the gene controlling tip rooting from the black raspberry to the red raspberry enables the latter to be propagated by tip layering and by leaf-bud cuttings.

3446. WILLIAMS, M. W., AND NORTON, R. A.
Propagation of red raspberries from softwood cuttings.
Proc. Amer. Soc. hort. Sci., 1959, 74: 401-6, bibl. 7, illus.

Leaf-buds, terminal shoots, young suckers and stem sections were used in an attempt to propagate raspberries from softwood cuttings under intermittent mist in coarse sand. With the Washington variety a low percentage of leaf-bud cuttings rooted, those taken in the middle of June from plants grown in the greenhouse giving the best results. With the Latham variety leaf-bud cuttings callused heavily but no roots developed. Young naturally etiolated sucker shoots of several varieties gave 100% rooting without growth substance treatment, and it is suggested that such cuttings might well be used in commercial practice. Artificial etiolation of the base section of terminal shoots increased rooting in Washington but not in Latham; the practice, however, is too laborious to be used commercially.—Utah St. Univ., Logan.

3447. SAHLSTRÖM, H.

Tillväxtstudier inom hallon. (**Growth studies on raspberries.**) [English summary 13 lines.] *Sver. pomol. Fören. Årsskr.* 1959, 1960, 60: 111-15, bibl. 3, illus.

In relation to rainfall; irrigation is advocated.

3448. RENTSCHLER, H., AND TANNER, H.

Ein Beitrag zur Kenntnis des Saftes von Sanddorn-Beeren. (**On the juice of sea buckthorn berries.**)

Reprinted from *Fruchtsaftind.*, 1957, 2: 83-6, bibl. 5, illus.

Hippophaë rhamnoides berries from Switzerland are shown to contain malic acid and quinic acid, the latter at a rate of approximately 12 g. per litre. The vitamin C content of the berries has been found to be several times as high as that of black currants. —Eidg. Versuchsanst., Wädenswil.

Vines—general.

3449. THIELE, K.

Der Weinbau und die Weinbauwissenschaft in der Volksrepublik Bulgarien. (**Viticulture in Bulgaria.**)

Dtsch. Gartenb., 1959, 6: 307-8.

Some 445,000 acres are under vines in Bulgaria, and by 1963 nearly 200,000 acres will be devoted to table grape production alone. The central research station for vine and wine problems is at Pleven, and the agricultural colleges at Sofia and Plovdiv possess viticultural and oenological departments.

3450. UEING, H. B.

Der Entwicklungsstand des Ahrweinbaues. (**Vine growing in the region of the River Ahr.**) *Weinberg u. Keller*, 1959, 6: 317-25, 353-7, bibl. 13.

3451. KALINKE, H.

Zur Methode der Produktionskostenermittlung. (**On a method of ascertaining production costs.**)

Weinberg u. Keller, 1959, 6: 122-6, bibl. 10.

In vine growing.

Vines—breeding and varieties.

3452. LOGOTHETIS, B.

Ampélographie et méthodes ampélographiques. (**Ampelography and ampelographic methods.**)

Bull. Off. int. Vin, 1959, 32(340): 3-10, bibl. 24.

A review.

3453. GEISLER, G.

Untersuchungen zur Resistenzzüchtung gegen "Heuwurm"-Befall bei Reben. (**Investigations on breeding for resistance to the grape moths *Clysia ambiguella* and *Polychrosis botrana*.**)

Vitis, 1959, 2: 84-100, bibl. 8, illus.

A number of seedling characteristics of inter-specific *Vitis* crosses (Riesling, Sylvaner, Gutedel, *V. labrusca* × *V. riparia*, etc.) were examined in relation to resistance to the grape moth, *C. ambiguella*, and the grape berry moth, *P. botrana*. It was found possible to gain considerable information on likely resistance from the size, shape and site of the inflorescences. Thus seedlings with smooth, rather compact inflorescences, those with quickly developing inflorescences, or those growing in exposed positions on the stem or with small bracts proved much more resistant than those showing contrary characteristics. A certain number of stocks were not attacked at all. All of them showed the above mentioned characteristics to a marked degree, which indicates that such specific resistance peculiarities as protective odours are not involved. As regards the origin of seedlings, *labrusca* and 157 crosses showed poor resistance, and the absence of resistance characteristics, whereas *riparia* and particularly *rupestris* crosses showed better resistance. Among the *vinifera* crosses those in which Riesling was used were comparatively more susceptible than the others. —BundesforschAnst. Rebenz. Geilweilerhof.

3454. HYAMS, E.

10 years of vine trials in Kent.

Gdnrs' Chron., 1959, 146: 320-1, illus.

In tests of over 60 varieties, Baco 1 has proved outstanding for vigour and fruitfulness and Riesling × Sylvaner for quality. Baco 1 did best when grown as a horizontal cordon, the length of each vine being 10 ft. and the new wood being pruned to 3-4 ft. lengths instead of to spurs. In good years the grapes ripened in October and yielded wine of a fair quality. In bad years the fruit ripened in November but was actually sweetened by frost. Riesling × Sylvaner was subject to attacks of mildew and had to be sprayed frequently with bordeaux. This hybrid was earlier and produced larger fruit and bunches than either of its parents whilst retaining the characteristic aroma of Riesling. When grapes of Riesling × Sylvaner were vinified with grapes of Seyve Villard 5,276, the wine was greatly improved.

3455. BISSON, J.

L'Arribet ou Franc noir de l'Yonne. (**The vine variety Arribet or Franc noir de l'Yonne.**) *Progr. agric. vitic.*, 1960, 153: 12-15, 51-5, illus.

History and description of a black-fruited wine variety.

3456. SZÖKE, T.

L'"assou" de Tokay. (**Tokay "assou".**)

Bull. Off. int. Vin, 1960, 33(348): 5-12.

For the production of this special wine in Hungary the 2 wine varieties Furmint and Harslevelû are grafted mainly on *Riparia Portalis*. The charac-

teristics of these varieties are described, and particulars of lime tolerance and phylloxera resistance are given for various rootstocks.

Vines—propagation and rootstocks.

(See also 3507.)

3457. MUTHUKRISHNAN, C. R., AND VENKATARAMANI, K. S.

Effect of some plant growth regulators on rooting of grapevine air-layers.

From abstr. in *Madras agric. J.*, 1960, **47**: 30-1.

The best root initiation of air-layers on pruned vine shoots was induced by the application of 3 ml. of 5,000 p.p.m. IBA in a 50% alcoholic solution.

3458. PASTENA, B.

Influenza della toposi sulla ripresa in barbatello delle talee di vitigni portinnesti. (The effect of position of origin on the establishment of vine rootstock cuttings in the rooting bed.)

Riv. Vitic. Enol., 1960, **13**: 5-10, 39-52, bibl. 48.

Investigations carried out at Palermo involved 10 rootstock varieties. Cuttings were obtained by dividing the long primary shoots into 5 portions (2 basal, 2 median and 1 apical) and by using entire lateral shoots from the basal, apical and intermediate regions of the primaries. The most successful results in number and quality of rooted cuttings were given by the median and lower basal regions of the primary shoots. The upper basal cuttings ranked next, followed by lateral shoots from the basal and median regions. The apical cuttings and the lateral shoots from their region were the least successful. Rooting was influenced by the degree of ripening of the wood in the preceding season, and was generally better in Rupestris types than in those derived from Riparia. The lower basal cuttings, each complete with a thickened base, proved good material except in the variety 140 Ruggeri, in which they were often too large and hard.

3459. ALLEY, C. J.

Studies on rooting of grape cuttings.

Calif. Agric., 1960, **14**(1): 3.

Experiments carried out over a 3-year period showed that fruiting varieties rooted better when the top bud of the cutting was left exposed than when it was covered with a mound of loose soil. Cuttings of the common rootstocks, however, varied from year to year in their response to mounding. Rootstock cuttings with only a top bud rooted as well as, or slightly better than, those with a top and bottom bud. Cuttings of the rootstock St. George and the table varieties Thompson Seedless and Tokay were severely injured when

allowed to dry out for 8 hr. on open ground before planting, but French Colombard and Petite Sirah could still be rooted after 72 hours of desiccation.—Univ. Calif., Davis.

3460. MAY, P.

Inhibition of rooting by maleic hydrazide.

J. Aust. Inst. agric. Sci., 1959, **25**: 304-6, bibl. 2.

Maleic hydrazide at 200, 50, 12, and 3 p.p.m. and tap water were applied in 2 experiments to sultana cuttings, which were planted in vermiculite in a glasshouse. In the first experiment MH was applied by placing the basal ends of the cuttings in the liquid for 24 hours before planting. Roots and shoots were weighed and shoot length measured after 40 days. In the second experiment MH was applied to the rooting medium before planting. The number, length and weight of roots were measured 3 months after planting. Results showed that root formation was severely restricted even by low concentrations of MH, using either method of application.—C.S.I.R.O., Merbein.

3461. ŠVÁSTA, J.

Příspěvek ke studiu tvorby kalusu u révy vinné. (A contribution to the study of callus formation in vines.) [Russian and German summaries $\frac{1}{2}$ p. each.]

Acta Univ. Agric. Silv., Brno, Ser. A., 1959, No. 4, pp. 539-47, bibl. 6, illus.

The intensity of callus formation varied greatly in the 13 species of *Vitis* and 5 rootstock varieties examined. Among the rootstocks it was at its strongest in Riparia Portalis and Berlandieri $\times$ Riparia 5 BB. A positive correlation was found between the area of a straight cut and amount of callus formed on 1-year-old wood, but none between the length of internodes and callus formation during stratification. Experiments have shown that the scion wood is best cut 1-2 cm. below the bud. Prolonged stratification at high temperatures, while favourable for callus formation, caused premature root formation in the stratification box and more vigorous shooting of the scion, which reduced the yield of first class grafts.

3462. MOSKALENKO, V. K.

The effect of humic acid on the development of vines in the nursery on the Lower Dnieper sands. [Russian.]

Gumin. Udobrenia, Har'kov, 1957, pp. 303-11, from *Ref. Ž. (Biol.)*, 1959, No. 19, Abstr. 87,249.

The experiments were carried out on uniform sands consisting of 98% quartz and containing only 0.1% humus. Soaking vine cuttings in 0.003% humic acid for 24 hours improved the survival of the cuttings and increased the proportion of first quality transplants. The additional application of

0.002% humic acid in the irrigation water also improved growth.

3463. CONRAD, H.

Die Bodenheizung in der Rebschule. (**Soil warming in the vine nursery.**)

Weinberg u. Keller, 1959, 6: 219-22.

One year's trials on electric soil warming in the open yielded promising results.

3464. ŽUK, K. P.

A new method of grafting vines. [Russian.] *Sadovodstvo*, 1960, No. 2, p. 53, illus.

The method of top-working vines, which is illustrated, requires only a wedge shaped slot in the stump of the old stem instead of a transverse split which may give access to harmful bacteria.

3465. CONSTANTINESCU, G., AND OTHERS.

Studii comparative al soiurilor de viță roditoare altoite și pe rădăcini proprii. (**Comparative study of grafted and ungrafted grape vines.**) [English, French, Russian and German summaries 1 p. each.]

Grăd. Via Liv., 1959, 8(5): 23-4 + summaries.

Grafting usually improved plant vigour and adaptability and fruit yield and quality.

3466. BREIDER, H.

5 Jahre röntgendiagnostische Studien an Rebenunterlagensorten. (**Five years' X-ray studies of vine rootstocks.**)

Weinberg u. Keller, 1959, 6: 225-9, bibl. 4, illus.

Studies, for breeding purposes, of the wood: medulla ratio which determines success in grafting.

3467. SCHENK, W.

Die Ampelographie als Grundlage zur Schaffung sortenreiner Unterlagsschnittgarten. (**Ampelography as the basis for the creation of vine nurseries containing only pure varieties.**)

Weinberg u. Keller, 1959, 6: 163-70, bibl. 10, illus.

Identification characters of several different types of rootstock described.

3468. MOOG, H.

Foliometrische Untersuchungen zum Nachweis der Identität von Unterlagsrebsorten verschiedener Herkunft. (**Leaf measurement studies to determine the identity of vine rootstock varieties of different origin.**)

Weinberg u. Keller, 1959, 6: 335-41, bibl. 6, illus.

3469. MIHALCA, G.

Comportarea portaltoiului Rupestris du Lot în condițiile pedoclimatice din R.P.R. (**The behaviour of the Rupestris du Lot rootstock under the pedoclimatic conditions of the Roumanian People's Republic.**)

Grăd. Via Liv., 1959, 8(9): 27-31.

The roots of this vine rootstock penetrate deeply and make it particularly suitable for deep soils with a low water-retaining capacity. It is resistant to lime-induced chlorosis and to soil chlorides. It is compatible with many of the most fruitful varieties. Disadvantages are the late ripening of the wood and its relatively poor nursery performance.

Vines—climatic factors.

3470. THIEL, A.

Services d'avertissement contre les accidents météorologiques et les attaques parasitaires de la vigne. (**Warning services against weather hazards and attacks of diseases and pests on vines.**)

Bull. Off. int. Vin., 1960, 33(350): 5-20.

General considerations, including frost and hail warnings, and brief reports from individual countries.

3471. NICOLLIER, J.

Quelques réactions de la vigne au climat exceptionnel de 1959. (**Some reactions of vines to the exceptional climatic conditions of 1959.**)

Progr. agric. vitic., 1960, 153: 146-51, bibl. 2.

Swiss vines on the whole were favourably affected by the sunny, hot and dry summer of 1959, giving record yields of fruit with high sugar contents. There were, however, a few instances of "star" flowers in the variety Fendant-Chasselas, leaf scorch and root injury after fertilizer application, injuries from using cold irrigation water, and breaking of fruit stalks owing to rapid and excessive enlargement of the grapes after irrigation.

3472. VAUPEL, A.

Advektivfrost und Strahlungsfrost. (**Convection and radiation frosts.**) [English summary 13 lines.]

Mitt. dtsh. Wetterdienst., 1959, 3(17): 5-31, bibl. 5, illus.

A meteorological survey of vineyards of the Palatinate damaged by late spring frosts in 1957.

3473. WITTE, K.

Neue Ergebnisse zur Frage der direkten Frostschutzberechnung. (**New data on the question of direct sprinkler irrigation for frost protection.**)

Weinberg u. Keller, 1959, 6: 95-100.

The data presented are arranged under the following heads: (1) The degree of frost protection provided by a given rate of irrigation; (2) The effect of the duration of interruptions in irrigation on the temperature curve of the leaves; (3) The leaf temperature curve resulting from sprinkler irrigation at 1.5 mm. per hour with interruptions of 2 min. duration; (4) The leaf temperature curve resulting from sprinkler irrigation at 6 mm. per

hour with interruptions of 1 min. duration;
(5) The physiological response of plants to frost;
(6) The effect of wind on the efficiency of sprinkler irrigation for frost protection.—Inst. Obstb., and Versuchswirtsch. Marhof, Bonn.

3474. PERROT, A.

Die temperaturgesteuerte intermittierende Beregnung. (**Temperature-controlled intermittent sprinkler irrigation [for frost protection in vines].**)

Weinberg u. Keller, 1959, 6: 409-16.

The need for such equipment discussed.

3475. WEISE, R.

Gedanken zur Erklärung der Frostschäden 1959 beim Einsatz von Beregnungsanlagen. (**An explanation of the frost damage occurring in 1959 in sprinkler-protected vineyards.**)

Weinberg u. Keller, 1959, 6: 332-5.

Theoretical considerations on the action of sprinkler irrigation during a spring frost.

Vines—soil management and nutrition.

3476. KAVEN, E.

Die Mechanisierung des Stockräumens im Weinbau. (**The mechanization of soil cultivation in viticulture.**)

Mitt. Klosterneuburg, Ser. A, 1959, 9: 1-11, illus.

An economic study proved the superiority of a small-gauge tractor and a hand tractor over manual labour.

3477. MIHALACHE, L.

Comportarea plantațiilor de vii pe diferite tipuri de terase din podgoria Valea Călugărească. (**The performance of vineyards on different types of terraces at Valea Calugareasca.**) [English, French, Russian and German summaries $\frac{1}{2}$ p. each.]

Grăd. Via Liv., 1959, 8(10): 13-19.

Recommendations are made on the breadth and angle of slope of soil conservation terraces. Grassing the slopes prevents soil movement and the hay crop helps to offset the cost of maintaining the terraces. Grape yields from different planting systems are presented.

3478. SCHANTL, D.

Zur Frage der Dauerberasung im Weinbau. (**On the question of permanent grass in vineyards.**)

Mitt. Klosterneuburg, Ser. A, 1959, 9: 23-7, illus.

Soil conservation and the incorporation of humus, especially in vineyards on slopes, can be achieved more cheaply by short-term cover crops than by a permanent grass sward.

3479. PEYER, E.

Abschwemmverhütung durch Kompost im Rebbaubau. (**The prevention of erosion in vineyards by means of compost.**)

Schweiz. Z. Obst- u. Weinb., 1960, 69: 109-11.

The application of compost from town waste and of a proprietary compost again prevented erosion in steeply sloping vineyards [see also H.A., 29: 1213].

3480. SCHRADER, T.

Humusbedarf und Humusversorgung der Weinberge unter besonderer Berücksichtigung von Stadtmüll und Klärschlamm. (**The humus requirements and the humus supply of vineyards, with special reference to town waste and sewage sludge.**)

Weinberg u. Keller, 1959, 6: 281-9, illus.

Various manures, composts and mulches discussed.

3481. JEZERNICZKY, L.

A venyige-trágyázás. (**Manuring with vine-shoots.**)

Agrártudomány, 1959, 11(6): 11-13, from Hung. agric. Rev., 1959, 8, Abstr. 323.

Composted vine prunings applied with NPK were more effective in vineyards than non-composted prunings, which gave yields similar to those produced by FYM alone.

3482. HEMEL, J. W.

Zur Wirkungsweise des Bodenkrümlers Flotal. (**On the action of the soil conditioner Flotal.**)

Weinberg u. Keller, 1959, 6: 3-9, 70-5, 88-95, 136-47, bibl. 43, illus.

Flotal was shown to improve both the structure of vineyard soils and the availability of nutrients. The preparation consists of 85% ferriammonium alumina, 10% organic substances and 2-5% ammonium nitrogen.

3483. GÄRTEL, W.

Über das Auftreten von Wachstumsstörungen an Reben auf den Lehm Böden der Moselterrassen. (**The incidence of growth disturbances in vines growing in the loam soils of the Moselle terraces.**)

Weinberg u. Keller, 1959, 6: 56-70, bibl. 23, illus.

The problems of basic manuring and nutrient deficiencies are discussed.

3484. GENTILINI, L.

Sulla nutrizione della vite. (**Vine nutrition.**) Riv. Vitic. Enol., 1960, 13: 91-4.

In a 6-year experiment, involving differential fertilizing of vineyard soils, there was little or no correlation between the rates of application of the nutrients and the composition of the leaves. In one variety the K contents of the leaves had begun

to differ by the 5th year in fertilized and unfertilized plots, but otherwise the analytical results were such as to throw serious doubt on the value of foliar diagnosis as a guide to the nutritional requirements of vines.

3485. GOGOLEVA, G.

The effect of foliar nutrition with phosphorus on the activity of vines in the nursery. [Russian.]

Sb. Stud. nauč.-issled. Rabot. Mosk. s.-h. Akad. Timirjazeva, 1958, No. 8, pp. 136-41, from *Ref. Ž. (Biol.)*, 1958, No. 19, Abstr. 87,247.

Foliar-applied P reduced the carbohydrate content of the leaves during the course of the day owing to increased translocation. By the end of the growth period the carbohydrate content had increased in all parts of the plant and the sugar content in the roots. The wood ripened better.

3486. VNUKOVA, A. S., AND RYŽA, V. K.

The nutrition of vines with manganese and boron micronutrients. [Russian.]

Tr. Odessk. s.-h. In-ta, 1957, 8: 64-70, from *Ref. Ž. (Biol.)*, 1958, No. 19, Abstr. 87,252.

In addition to basic fertilizers, soil applications of 2.6 g. B, 10 g. MnSO_4 and 20 g. NPK per plant were made before flowering, or foliar applications of 0.02% B, 0.06% MnSO_4 or KMnO_4 and 2% NPK were made both before flowering and a month after flowering. Although yields and sugar contents were increased by both types of treatment, so long as adequate soil moisture was present, the soil application was the more effective, but spraying the more economical, method.

3487. GÄRTEL, W.

Schäden an Reben durch übermässige Boraufnahme aus dem Email von Mitscherlichgefässen. (**Injuries to vines resulting from the excessive uptake of boron from the enamel of Mitscherlich containers.**)

Weinberg u. Keller, 1959, 6: 406-9, bibl. 4, illus.

Leaf symptoms of boron toxicity frequently occurred in vines grown in Mitscherlich containers. The B content in the dry matter of affected leaves was about 200 p.p.m., which is about 10 times the normal amount. It is likely that acid root secretions favour the dissolving of B from the enamel of the containers.—Inst. Rebenkrankh., Bernkastel-Kues/Mosel.

3488. GÄRTEL, W.

Untersuchungen über den Kupfergehalt von Rebteilen und Most. (**Studies on the copper content of different parts of the vine and of must.**)

Weinberg u. Keller, 1959, 6: 431-40, bibl. 24, illus.

All the different parts of vines examined were

found to contain copper. Disregarding the roots, the copper content was highest in 3-day-old shoots, laminae, inflorescences, tendrils and buds. Woody parts and berries had a low concentration of copper. The copper content of roots, which is proportional to that of the nutrient medium, ranged from 5 p.p.m. to about 2,000 p.p.m. in the dry matter. Vine roots with a Cu content exceeding 150 p.p.m. ceased to function fully. They failed to translocate iron, thus causing chlorosis and a disturbance of growth. Must contained from 0.2 to 4.0 mg./l. of Cu. The maximum Cu requirement of vines is estimated to be 120 g./ha.—Inst. Rebenkrankh., Bernkastel-Kues/Mosel.

3489. ZAKOSEK, H.

Zum Kalkgehalt von Weinbergsböden in Hessen und zur bodenbedingten Chlorose. (**On the lime content of vineyard soils in Hesse and lime-induced chlorosis.**)

Weinberg u. Keller, 1959, 6: 85-8, bibl. 6.

The danger of chlorosis appears to exist where the soil content of available lime exceeds 4% in conjunction with poor drainage.—Hess. Landesamt Bodenforsch., Wiesbaden.

3490. DOBROLJUBSKIJ, O. K.

The effect on plants of mercury as a trace element. [Russian.]

Doklady Akad. Nauk SSSR, 1959, 128: 1080-3, bibl. 5.

A 0.084 micromolar solution of mercury sulphate sprayed on to vines at the beginning of mass flowering and again 3 weeks later increased the weight and sugar content of the berries, reduced their acidity and advanced ripening. Although Hg did not materially affect the redox potential or pH, it increased the activity of ascorbinoxidase, polyphenoloxidase and peroxidase in the leaves and berries and the chlorophyll content of the leaves. It also affected carbohydrate metabolism, resulting in a higher content of total sugars in both leaves and berries.

Vines—training and pruning.

3491. MEL'NIKOV, V. I.

Training vines to facilitate mechanization in vineyards. [Russian.]

Sadovodstvo, 1960, 98(2): 39-43, bibl. 1, illus.

Training systems suitable for mechanized vineyards are described and illustrated. The shortened fan type is similar to the regular fan but has much shorter shoots. For surface cordons the cuttings are planted so that the upper buds are level with the soil surface. One shoot is allowed to develop in each direction along the row, close to the soil surface, with vertical shoots at intervals. Underground cordons are similar to surface cordons except that the main branches are 10-15 cm. below the soil surface.

3492. PEYER, E.

Erfahrungen mit dem 2-Etagenschnitt im Rebbaue. (**Observations made on the training of vines along wires at two levels.**)

Schweiz. Z. Obst- u. Weinb., 1960, 69: 77-82, illus.

The recommendation to convert closely planted staked vineyards to the labour-saving system of training the vines along wires [see *H.A.*, 28: 206] has been justified by results. The two wires should be at a height of 70 cm. and 1 m. 20 cm. Either the two fruiting arches of the same vine are trained along different wires, the upper arch down the slope and the lower arch up the slope, or both arches of alternate vines are trained along the same wire. A comparison of the two systems for one year suggests that the former is preferable.

3493. FILIPPENKO, I. M.

The dynamics of the dry matter content in vine shoots after summer pruning. [Russian.]

Bull. nauč.-tehn. Inf. centr. genet. Lab. Mičirina, 1957, No. 3, pp. 35-7, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,531.

The dry matter contents of the 5th, 10th, 15th and 20th nodes were determined 3, 6 and 10 days after pinching back the shoots, removing the laterals or defoliation, all treatments being completed by 20 July. The dry matter content increased, and bud development improved, where the shoots and laterals were pinched back. Complete removal of the laterals reduced the assimilatory area, depressed the dry matter content, caused renewed growth and induced dormant buds to break.

Vines—growth, reproduction and physiology.

(See also 3160, 3167.)

3494. ZIMMERMANN, J.

Entwicklungsrhythmus der Rebsorten und Affinität. (**The developmental rhythm of vine varieties and their compatibility.**)

Weinberg u. Keller, 1959, 6: 171-80, illus.

Leaf development, transpiration rates, shoot histology and wood ripening of some scion and rootstock varieties.

3495. ALLEWELDT, G.

Das vegetative Wachstum 1 jähriger Reben in Abhängigkeit von der Tageslänge. (**The vegetative growth of 1-year-old vines in relation to day-length.**)

Vitis, 1959, 2: 101-12, bibl. 26, illus.

One-year-old budlings of Riesling 90 and other clones were submitted to normal daylight conditions of 11 hours as well as to day-lengths of 13 and 15 hours and also to 11-hour day-lengths with an interruption of darkness from midnight till 1 a.m. Decreasing day-length led to premature dormancy, as also to decreased extension growth

due to a rapid restriction in internode length and diminished leaf production. Short-day treatment in general encouraged wood ripening, though the actual speed of this process varied according to the clone. Gibberellic acid delayed the onset of dormancy, but indolylacetic acid had no effect. Photoperiodic stimulation was communicated to all leaves but not demonstrably so to stems or shoot tips. The photoperiodic reactions are considered explicable on the assumption that growth-inhibiting substances are formed as the result of short-day conditions following the all important previous preparation made for them by the long phase of darkness. It is further assumed that indolylacetic acid has a subsidiary role, and gibberellin or gibberellin-like substances a more important role, in the production of these phenomena.—BundesforschAnst. Rebenz., Geilweilerhof.

3496. ALLEWELDT, G.

Aufnahme und Weiterleitung des photoperiodischen Reizes bei *Vitis vinifera* L. (**The induction and translocation of a photoperiodic stimulus in *Vitis vinifera*.**)

Naturwissenschaften, 1959, 46: 177, bibl. 9.

When different leaves on the same vine were treated simultaneously with different day-lengths, short-day treatment always proved dominant. The cessation of growth induced by short-day treatment is considered to be due to the formation of a growth-inhibiting substance.—BundesforschAnst. Rebenz., Geilweilerhof.

3497. KOLESNIK, Z. V.

The formation of the inflorescence in the vine (*Vitis vinifera*) during the winter-spring period in relation to increased fruiting. [Russian.]

Bot. Žurnal, 1959, 44: 1730-4, bibl. 19.

Deep dormancy of vines in the southern Ukraine end about November, and the initiation and differentiation of inflorescence primordia proceeds during enforced winter dormancy. Well before the spring the reserve supplies begin to move in the shoots to their places of utilization, in the first instance to the bases of the buds, causing a rapid bursting when temperatures become favourable. An aqueous NPK solution applied in July–August increased the number of inflorescences in the buds the following spring.

3498. KESSLER, B., BAK, R., AND COHEN, A.

Flowering in fruit trees and annual plants as affected by purines, pyrimidines and triiodobenzoic acid.

Plant Physiol., 1959, 34: 605-8, bibl. 21.

In a study of the effects of various purines and pyrimidines on the flowering of olives, vines [see also *H.A.*, 30: 1865], seedling grapefruit and beans, uracil, xanthine and caffeine promoted flowering, whereas adenine and guanine did not. In olives

and grapefruit xanthine, and in grapevines uracil, were most effective. The increase in flowering was paralleled by an increased protein N and RNA/DNA ratio.—Agric. Res. Stat., Rehovot, Israel.

3499. HUGLIN, P., AND JULLIARD, B.

Action de l'hydrazide maléique sur la vigne.
(The effect of maleic hydrazide on the vine.)

Vitis, 1959, 2: 65-70, bibl. 5, illus.

Experiments in Alsace show that under certain conditions, not as yet clearly defined, treatment with MH may result in prolongation of dormancy, but that its other effects on the vine, e.g. total inhibition of shoot growth, coulure, etc., are so pronouncedly deleterious that there is no hope of economically using it to prolong dormancy for the purpose of avoiding frost damage.—Stat. Rech. vitic. oenol. (I.N.R.A.), Colmar.

3500. HARTMAIR, V.

Über die Wirkung von Maleinsäurehydrazid auf Rebstecklinge. (The effect of maleic hydrazide on vine cuttings.)

Mitt. Klosterneuburg, Ser. A, 1959, 9: 38-43, bibl. 3, illus.

MH delayed shoot growth of vine cuttings in the greenhouse, but on mature vines in the field results were so erratic that its use cannot be recommended as a method of delaying bud burst.

3501. RIVES, M., AND POUGET, R.

Action de la gibberelline sur la dormance de la vigne (*Vitis vinifera* L.). (The effect of gibberellin on the dormancy of the vine.)

C.R. Acad. Sci., Paris, 1959, 248: 3600-2, bibl. 5, illus.

Treatment with GA (up to 100 mg./l.) during growth delayed bud burst in the following year on the treated branches, in addition to the usual effect of lengthening the shoots. Applied in the dormant period it caused prolonged dormancy only. It is suggested that this effect could be used for frost protection.—Cent. Rech. agron. Sud-Ouest, Pont-de-la-Maye.

3502. ALLEWELDT, G.

Austriebshemmung ruhender Knospen von Reben durch Gibberellinsäure. (The inhibition of growth in resting vine buds by gibberellic acid.)

Naturwissenschaften, 1959, 46: 434, bibl. 7.

GA applied in lanolin or in solution to 2-bud cuttings delayed bud burst by up to 17 days.

3503. ALLEWELDT, G.

Förderung des Infloreszenzwachstums der Reben durch Gibberellinsäure. (Encouraging the growth of grape vine inflorescences by gibberellic acid.)

Vitis, 1959, 2: 71-8, bibl. 8, illus.

Riesling clone 90 and Sylvaner clone 64 and three recent crosses, both on their own roots and worked

on Kober 5BB, were treated with a 50 mg./l. solution of GA on the 13 and 20 May, i.e. 3-4 weeks after bud burst. In all cases the growth of the bunches and in particular the growth in length of individual grapes was considerably increased. The effect was greatest in the youngest inflorescences and was more noticeable in budded plants than in those on their own roots.—Bundesforsch.-Anst. Rebenz., Geilweilerhof.

3504. WEAVER, R. J., AND McCUNE, S. B.

Effect of gibberellin on seedless *Vitis vinifera*.

Hilgardia, 1959, 29: 247-75, bibl. 13, illus.

Experiments were performed in 1958 on 3 seedless varieties. Berry-growth curves of Black Corinth and Thompson Seedless were double sigmoid when growth increments in diameter were plotted. GA increased berry diameter but did not alter the general shape of the curves. On clusters of Black Corinth or Thompson Seedless only the treated portions responded to GA. In Black Corinth increasing concentrations from 1 to 100 p.p.m. usually progressively increased berry size and length-to-width ratio. Black Corinth showed little increase in size of berry as a result of foliage applications of GA. The percentage increase in length of young Thompson Seedless clusters dipped in GA was greatest in the apical portions and least in the basal (peduncle). Thompson Seedless vines were sprayed at 10, 25 or 50 p.p.m. at 4 pre-bloom stages. Length of cluster was increased by the second application. Weight of fruit was sometimes decreased by GA, but in 2 of 4 instances, in which crop level could be eliminated as a factor, maturation was hastened. GA at 1 p.p.m. and higher, applied after shatter, increased berry size of Thompson Seedless. The compound at 1,000 p.p.m. injured the berries, but not the foliage and shoots. The largest berries resulted from combined GA and girdling treatments. The largest berries in Thompson Seedless were produced by spraying at the shatter stage; later sprayings produced progressively smaller berries. GA absorbed by the leaves had only a small effect on enlargement of the fruit. GA increased berry size of Black Monukka. [From authors' summary. For earlier work see *H.A.*, 29: 3360.]—Univ. Calif., Davis.

3505. WEAVER, R. J., AND McCUNE, S. B.

Effect of gibberellin on seeded *Vitis vinifera*, and its translocation within the vine.

Hilgardia, 1959, 28: 625-45, bibl. 10, illus.

Four seeded grape varieties were treated, at various stages of development, with GA as a water-soluble potassium salt (80% active ingredient). The compound was applied by dipping, spraying or painting, in amounts ranging from 1 to 100 p.p.m. Dipping Zinfandel clusters and spraying entire vines at various pre-bloom, bloom and post-bloom

stages gave various results, including: elongation and loosening of clusters; shot berries; accelerated flowering, fruit coloration and ripening; a higher percentage of soluble solids; a decrease in rot; and some reduction of crop. Carignane vines sprayed, at six stages of development, with GA at 1 to 50 p.p.m. gave results similar to those for Zinfandel. There was loss of crop weight because of fewer berries in the sprayed clusters. In translocation experiments GA was not translocated from one shoot to another, judging by its effect on shoot elongation. Red Malaga shoots about 3 ft. long showed just as much additional growth when only the apical 6 in. were sprayed as when the whole shoot was sprayed. In 6-in. Carignane shoots more GA reached the apex when the basal leaf was treated than when an apical leaf was treated. An experiment in which foliage and/or clusters of Zinfandel were treated showed that much cluster elongation and shot berry development resulted from absorption of GA by the leaves. [From authors' abstract.]

3506. WEAVER, R. J., AND McCUNE, S. B.
Girdling: its relation to carbohydrate nutrition and development of Thompson Seedless, Red Malaga, and Ribier grapes.

Hilgardia, 1959, 28: 421-56, bibl. 21.

Girdling experiments with 3 varieties of grapes over an 8-year period verified earlier findings or hypotheses that: (1) Carbohydrates are increased above the girdles and decreased in the roots. (2) There is a sensitive time relation between girdling and maximum berry size in Thompson Seedless and between girdling and most rapid increase in maturation in Red Malaga and Ribier grapes. (3) Girdling does not permanently weaken the vines. [Authors' abstract.]

3507. LIDER, L. A., AND SANDERSON, G. W.
Effects of girdling and rootstock on crop production with the grape variety Chardonnay.
Proc. Amer. Soc. hort. Sci., 1959, 74: 383-7, bibl. 4, illus.

The effects of 3 girdle widths were compared on the seeded grape variety Chardonnay, grafted on 3 rootstocks in an unirrigated vineyard. Average yields for the control vines in 2 years show that vines on the rootstock AXR No. 1 outproduced vines on Rupestris St. George by 43%. A trunk girdle $\frac{1}{16}$ in. wide, performed at full bloom, was very effective in increasing the proportion of seedless berries on the clusters, and increased fruit yields 35% over ungirdled vines. A trunk girdle $\frac{1}{8}$ in. wide had less influence on yield. The girdling treatments delayed fruit maturity and slowed average annual increase in trunk circumference by about one-half. [Authors' summary.]—Univ. Calif., Davis.

3508. TKAČENKO, G. V.

The role of substances secreted by the stigma in the pollination of the vine (*Vitis vinifera*). [Russian.]

Bot. Zhurnal, 1959, 44: 963-7, bibl. 20.

Pollination of 2 varieties of vine caused the droplets of liquid secreted by the stigmas to remain much longer on the surface than on unpollinated stigmas. The liquid, when included in nutrient media, improved the percentage germination of pollen grains.

3509. RIBEREAU-GAYON, G.

Sur la genèse des acides organiques dans la vigne. (On the origin of organic acids in the vine.)

C.R. Acad. Sci., Paris, 1959, 248: 3606-8, bibl. 1.

Malic acid, synthesized in the roots, undergoes partial conversion to tartaric acid in the leaves, the extent depending on variety.

Vines—grape composition.

3510. KEPNER, R. E., AND WEBB, A. D.

Skin pigments of red grape varieties.

Calif. Agric., 1960, 14(1): 2.

The pigment patterns of some 170 vinifera grape varieties were determined. The number of pigment bands varied from 2 or 3 in several lightly pigmented table grape varieties to a normal maximum of 8 in a large number of vinifera varieties. The identification of the pigments present in all 8 bands is under investigation.—Univ. Calif., Davis.

3511. HENNIG, K., AND BURKHARDT, R.

Vorkommen und Nachweis von Quercitrin und Myricitrin in Trauben und Wein. (The presence and determination of quercitrin and myricitrin in grapes and wine.)

Weinberg u. Keller, 1960, 7: 1-3, bibl. 4.

3512. MÜNZ, T.

Papierchromatographische Bestimmung der Wein- und Äpfelsäure in Weinen, Mosten, Fruchtsäften, Presssäften und schwerlöslichen Wein- und Äpfelsäure-Salzen. (The paper chromatographic determination of tartaric and malic acids in wines, must, fruit juice and press juice and in tartaric and malic acid salts of low solubility.)

Weinberg u. Keller, 1959, 6: 455-6.

Temperate nuts.

(See also 3236.)

3513. SARFATTI, G.

Ricerche sull'endosperma e l'austorio endospermatico di *Prunus communis* (nota preventiva). (Studies on the endosperm and endospermic haustorium of *Prunus communis* (preliminary note).) [English summary 5 lines.] *Nuovo G. bot. ital.*, 1958, 65: 371-5, bibl. 13, illus.

Anatomical and histological work on almond seeds is reported.

3514. KESTER, D. E., AND GRIGGS, W. H.

Fruit setting in the almond: the effect of cross-pollinating various percentages of flowers.

Proc. Amer. Soc. hort. Sci., 1959, 74: 206-13, bibl. 2.

Observations on Texas and Nonpareil almonds over 3 seasons indicated that at the time of blossoming almond flowers vary in their tendency to set fruit. This tendency seems to be a characteristic of the individual flower. Hence the loss of a proportion of the flowers or the failure of a proportion of them to be cross-pollinated is not compensated for by an increase in the percentage set of those remaining. To obtain a maximum crop, therefore, 100% of the flowers should be cross-pollinated.—Univ. Calif., Davis.

3515. KESTER, D. E., AND GRIGGS, W. H.

Fruit setting in the almond: the pattern of flower and fruit drop.

Proc. Amer. Soc. hort. Sci., 1959, 74: 214-19, bibl. 9.

A 2-year study of flower and fruit drop in Nonpareil almonds showed that there are 3 periods of drop, but that all 3 may not occur during the same spring. The first drop takes place during or shortly after bloom and consists largely of defective flowers which drop without any appreciable enlargement of their ovaries. This occurred in 1956 but not in 1955 and was probably associated with the mild winter of 1955/56 which affected bud development. The second drop takes place about a month after bloom and consists of flowers with pea-sized ovaries which have not shed their floral tubes. These flowers have mainly not been cross-pollinated, but some that have been cross-pollinated may also drop at this period. The third drop takes place 6-7 weeks after bloom and consists of larger fruits which have shed their floral tubes. This is equivalent to "June drop" in other fruit species, and occurs only in certain seasons when initial fruit set is relatively high. Various factors may be responsible for this last drop of almonds.—Univ. Calif., Davis.

3516. ICHI, T.

Propagation of chestnut by layering. II. Rooting abilities of some cultivated varieties. [Japanese, with English summary $\frac{1}{4}$ p.]

J. hort. Ass. Japan, 1959, 28: 183-7, bibl. 17, illus.

Varieties of Japanese and Chinese chestnut, which were difficult to root with IBA alone, rooted better with a mixture of IBA and 2,4,5-TP or with 2,4,5-TP alone, both applied in lanolin paste. Foliar application of 2,4,5-TP to seedlings in layer

beds produced vigorous rooting. The larger the shoot, the lower was the rooting percentage. Rooting was greater after stem elongation had ceased. Considerable varietal differences were noted in the rooting percentage and time required for rooting, and a higher rooting percentage was accompanied by a shorter rooting time.

3517. TÜREL, S. S., AND AYFER, M.

Report to the Government of Cyprus on improvement of pistachio nut production.

Rep. FAO/ETAP 1015, Rome, 1959, pp. 23, bibl. 6, illus.

Insufficient chilling in the dormant period and defects in pollination are the two main causes of failure. The Red Aleppo variety seems to require less chilling than other varieties, but some strains are not reliable. *Pistacia vera* male trees are most suitable for pollination, and budwood should be imported and grafted on local wild rootstocks.

3518. MANNING, W. E.

The genus *Juglans* in South America and the West Indies.

Brittonia, 1960, 12: 1-26, bibl. 46, illus.

Botanical descriptions of 6 species and some hybrids.

3519. N.S.W. DEPARTMENT OF AGRICULTURE, DIVISION OF HORTICULTURE.

Walnut growing.

Agric. Gaz. N.S.W., 1959, 70: 481-3, illus.

The subjects discussed include climate, soil, varieties, propagation, planting, pruning, maintenance, harvesting and processing.

3520. SERR, E. F., AND FORDE, H. I.

Blackline, a delayed failure at the union of *Juglans regia* trees propagated on other *Juglans* species.

Proc. Amer. Soc. hort. Sci., 1959, 74: 220-31, bibl. 12, illus.

Blackline [see *H.A.*, 29: 3375] attacks trees only after they have reached physiological maturity. It is most commonly found in trees on *J. hindsii*, but has also been found in trees on *J. nigra*, *J. californica* and Paradox and Royal hybrids, but not in trees on *J. regia* rootstocks. Trees of the Contra Costa Persian variety on *J. hindsii* were less susceptible to blackline than trees of Concord on the same rootstock. There was no difference in rate of development of blackline when scions of Concord were taken from affected and healthy trees; this indicates that the trouble is not induced by a virus carried in the scion wood. There was a consistent decrease in the incidence of blackline per union, as the number of unions per tree increased from 1 to 4. Height of the union above ground had no effect on the incidence of

blackline. No consistent evidence has been found that blackline is associated with any climatic or soil physical factor. The distribution pattern in California suggests that a secondary factor, such as a virus or soil chemical element, may be involved in addition to scion/rootstock incompatibility.—Univ. Calif., Davis.

3521. BRYNER, W.
Das Umpfropfen von Nussbäumen. (**The reworking of walnut trees.**)
Schweiz. Z. Obst- u. Weinb., 1960, **69**: 135-8, illus.
Methods described.

PLANT PROTECTION OF TEMPERATE FRUITS.

General.

(See also 4608, 4610, 4623.)

3523. HEBART, K. T.
Der Betriebsaufwand für den Pflanzenschutz im Südtiroler Erwerbsobstbau. (**Expenses incurred in the organization of plant protection by fruit growers in the South Tyrol.**)
[English and French summaries $\frac{1}{2}$ p. each.]
Gartenbauwiss., 1959, **24**: 142-60, bibl. 17.

In the South Tyrol the greatest expense is incurred in protecting fruit crops against red spider, scab, codling moth and San José scale. Costs per kg. of fruit produced during the years 1953 to 1956 are estimated at 5.1, 8.5, 8.1 and 4.1 liras, respectively [or approximately $\frac{1}{4}$ d. to $\frac{1}{2}$ d. per pound].—Inst. Wirtschaftslehre des Gartenbaues tech. Hochsch., München.

3524. ANON.
Guide to fruit tree spraying in the Adelaide hills.
J. Agric. S. Aust., 1959, **63**: 150-7.
Spray programmes for pome and stone fruits, with notes on special problems.

3525. SCHMIDLE, A., AND KRCZAL, H.
Die Krankheiten und Schädlinge der Erdbeere und ihre neuzeitliche Bekämpfung. (**Diseases and pests of the strawberry and modern control measures.**)
ErwObstb., 1960, **2**: 92-6, bibl. 31, illus.

Viruses.

(See also 3440, 3444.)

3526. KLINKOWSKI, M.
Aktuelle Probleme der pflanzlichen Virusforschung. (**Current problems of virus research in plants.**)
Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 10-36, bibl. 106, illus.

3522. BERCK, B.
Retention of acrylonitrile and carbon tetrachloride by shelled walnuts fumigated with Acrylon.
J. agric. Food Chem., 1960, **8**: 128-31, bibl. 13, illus.

Vacuum fumigation for 3 hours and subsequent aeration gave lower residual values of both constituents than atmospheric fumigation for 18 hours with fan aeration. In the former case the concentration of carbon tetrachloride fell to 0.5 p.p.m. 21 days after packing, and that of acrylonitrile to zero after 30 days.—Canada Dep. Agric., Res. Stat., Winnipeg.

A review, with many references to fruits, vegetables and ornamental plants.

3527. CADMAN, C. H.
Genetics as an aid to the control of plant virus infection.
Abstr. in *Heredity*, 1960, **14**: 222.

The production of varieties of plants which resist, or are immune to, infection by viruses, or which escape infection because they are unpalatable to virus vectors, seems to offer the most lasting solution to the problem of controlling virus spread in the field. These possibilities seem not to have been fully explored by geneticists, particularly in the raspberry, where genes controlling immunity or resistance to aphid- and soil-borne viruses exist among commercial varieties.

3528. KLEŠČEVA, V. A.
Little-leaf rosetting of apple trees. [Russian.]
Sadovodstvo, 1960, **98**(2): 32-4, illus.

To prevent the spread of this disease, considered to be caused by a virus, the annual inspection of trees used for propagation material and of rootstocks and nursery stock and the destruction of affected plants are recommended.

3529. KEGLER, H.
Untersuchungen über Virosen des Kernobstes. II. Das Ringfleckmosaikvirus der Birne. (**Studies on virus diseases of pome fruits. II. The ring spot mosaic virus of pear.**)
[English summary $\frac{3}{4}$ p.]
Phytopath. Z., 1960, **37**: 379-400, bibl. 36, illus.

Ring spot mosaic occurs relatively frequently in nurseries. As it is usually present in the variety Gellerts Butterbirne, which is used as a stem builder, there is a great danger of its spreading. It is characteristic of the disease that the symptoms are clearly detectable only in varieties of high and medium susceptibility, and only in the months of May and June. Varieties of low susceptibility

often show only diffuse spotting, and the foliage in summer is generally without symptoms. Symptom expression is accentuated when the shoots are cut back severely. The vegetative development of diseased trees is retarded; the increase in girth of the trunk is reduced by about 10%, and that of shoot extension and leaf area by about 20%. Diseased trees are more susceptible to frost than healthy ones. The chlorophyll content of the leaf areas affected by ring spot mosaic is reduced. The content of reducing sugars is increased by some 20% in diseased pear leaves by the end of July. Transmission can be effected by grafting shoots and pieces of bark, but not by rubbing. Tests on heat therapy have shown that the inactivation point of the virus and the point of irreversible damage to the scion lie apparently within the same range of temperatures. [From author's summary. For part I see *H.A.*, 30: 1913.]—Inst. Phytopath., Aschersleben.

3530. MILLIKAN, C. R.

Black end of pears.

Res. Bull. Dep. Agric. Vict. 1, [1959], pp. 14, bibl. 10, illus.

In Victoria the disease has been recorded in pear trees on *Pyrus serotina* and Kieffer rootstocks, though only a small proportion of trees on the latter are affected. The percentage of affected fruit on individual trees and branches may vary from year to year, and the symptoms may vary within and between varieties. This latter observation suggests that different types of the disease exist. Ring-spot symptoms in Packham's Triumph indicate that the disease may be virus in origin, but attempts to perpetuate or transmit it by grafting have been unsuccessful. Winter Nelis has remained free from the disease, except for one season, and is the only variety to do so, but, although symptomless, this variety was found to be capable of transmitting the disease to healthy scions of Packham's Triumph. The characteristic symptoms of the disease in the fruits of the main varieties are discussed. No evidence was found that calcium nitrate, boric acid, ammonium molybdate or a complete nutrient solution had any effect on the occurrence of the disease.

3531. POSNETTE, A. F., AND CROPLEY, R.

Virus diseases of cherry trees in England. III. Crop reduction caused by some viruses.

A.R. E. Malling Res. Stat. 1959, 1960, A43: 92-5, bibl. 8.

Cherry trees inoculated with viruses prevalent in Britain yielded less than uninoculated trees. The crops of mature Early Rivers trees were reduced by 72% by necrotic line pattern and 52% by tatter leaf; the crops of mature trees of Turkey Heart were reduced by 73 and 37% by these two viruses, respectively. Yields of young Early Rivers,

Napoleon, and Merton Bigarreau trees were reduced by rusty mottle, rugose mosaic, tatter leaf and necrotic line pattern. Young trees of the variety Merton Heart behaved differently, most of the infected trees cropping more heavily than uninoculated trees. This may be due to a rough-bark condition of unknown cause, that developed on all the Merton Heart trees, and was more severe on the vigorous trees than on those stunted by virus infection. [Authors' summary. For parts I and II see *H.A.*, 24: 1328 and 27: 266.]

3532. WILKS, J. M., AND REEVES, E. L.

Flowering cherry, a reservoir of the little cherry virus.

Phytopathology, 1960, 50: 188-90, bibl. 10.

Since trees of *Prunus serrulata* have been shown to carry the little cherry virus, flowering cherry trees should not be planted near sweet cherry orchards in areas where little cherry has not yet occurred.—Canada Dep. Agric., Summerland, B.C.

3533. BAUMANN, G.

Zur Frage der Identität europäischer Kirschvirose. (On the identity of European virus diseases of cherries.)

Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 81-5, bibl. 7.

Preliminary conclusions from work, which will be reported more fully elsewhere, suggest that the acid cherry enation virus from the Rhineland and the latent plum virus are identical with the Stecklenberger disease [*H.A.*, 26: 1538]. The latter is, however, not identical with Pfeffinger disease and the related ring spot virus or with rasp leaf.—Inst. Phytopath., Aschersleben.

3534. KEGLER, H.

Zur Differenzierung von Kirschenviren. 1. Die Viren der Pfeffinger (Rosetten-) und der Stecklenberger Krankheit. (The differentiation of cherry viruses. 1. The viruses causing the Pfeffinger (rosette) and Stecklenberger diseases.)

Phytopath. Z., 1960, 38: 209-13, bibl. 8, illus.

3535. ELLENBERGER, C. E.

Heat inactivation of some viruses in plum varieties and rootstocks.

A.R. E. Malling Res. Stat. 1959, 1960, A43: 99-101, bibl. 5.

Virus-infected plants of 3 scion varieties of plum and 2 clonal rootstocks were treated for periods of 15-39 days at 37° C.; virus-free material was then propagated from growth made during the treatment. Plum bark split, plum line pattern, and peach green mottle viruses were eliminated and also an unidentified virus causing necrosis and mosaic in peach seedling indicators. The green mottle virus was inactivated from entire plants of Victoria and Ontario, but Marianna plants

remained infected, although virus-free material was propagated from the tips of shoots grown at 37° C. [Author's summary.]

3536. SCHUCH, K.

Die Pockenkrankheit der Zwetsche. (**Plum pox.**)

Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 77-81, bibl. 2, illus.

Symptoms as observed in the district of Worms.

3537. TAKAMURA, Y., SHIMOMURA, T., AND HIRAI, T.

The nucleic acids concentrations in mulberry leaves as affected by dwarf disease. [English, with German summary 11 lines.]

Phytopath. Z., 1960, 38: 123-8, bibl. 3.

Pattern of concentrations somewhat different from that observed with some other viruses.

3538. VAN DER MEER, F. A.

Onderzoekingen betreffende bessevirussen in Nederland. I. Lepelblad van rode bes. (**Investigations on currant viruses in the Netherlands. I. Spoon leaf of red currant.**) [English summary $\frac{3}{4}$ p.]

Tijdschr. PlZiekt., 1960, 66: 12-23, bibl. 22, illus.

VAN DER MEER, F. A., AND JONG, J.

Lepelblad bij rode bessen. (**Spoon leaf of red currants.**)

Fruitteelt, 1960, 50: 192-3, illus.

This virus disease of red currants is practically restricted to the old plantations of De Bangert in the province of North-Holland. Leaves of infected bushes become less deeply lobed with fewer serrations than normal, and in severe cases they curl back and become concave. Infection reduces growth, but cropping capacity remains fairly good. The virus is spread by propagating from diseased plants; no vector has yet been found. Grafting experiments showed that the virus will cause a ringspot on tobacco and other herbaceous plants, and a slight mosaic but no spoon leaf symptoms on black currants. The virus is distinct from that causing reversion of black currants. Field observations showed that the first symptom of infection in red currants was a leaf mottling and that this disappeared when the spoon leaf symptoms developed. The only preventive measures that can be recommended at present are roguing and propagation from healthy bushes.—I.P.O., Wageningen, and R.T.C., Hoorn.

3539. LISTER, R. M.

Soil-borne virus diseases.

Sci. Hort., 1960, 14: 90-6, bibl. 21, illus.

The present state of our knowledge on this problem is reviewed, and possible control measures in the raspberry and strawberry crops are discussed [see also H.A., 30: 400].

3540. CROPLEY, R., ELLENBERGER, C. E., AND JHA, A.

Strawberry mosaic and apple mosaic virus in strawberry.

A.R. E. Malling Res. Stat. 1959, 1960, A43: 96-7, bibl. 5, illus.

Sap transmission to herbaceous plants showed that strawberry mosaic of the variety Royal Sovereign is caused by certain strains of the soil-borne raspberry yellow dwarf (arabis mosaic) virus. Apple mosaic caused similar symptoms in strawberry when transmitted by grafting, but repeated attempts failed to demonstrate sap transmission of this virus from strawberry to herbaceous plants. It is concluded that symptoms on strawberry are a poor guide to diagnosis, and that sap transmission to herbaceous plants is the only sure means of distinguishing the soil-borne virus diseases from those caused by other viruses.

3541. POSNETTE, A. F., AND JHA, A.

The use of cuttings and heat treatment to obtain virus-free strawberry plants.

A.R. E. Malling Res. Stat. 1959, 1960, A43: 98, bibl. 2.

After heat treatment at 37° C. for 2 or 3 weeks strawberry plants of the varieties Cambridge Favourite and Huxley's Giant were propagated from disc cuttings, 0.5-1.0 cm. thick, made by slicing the crown transversely [see H.A., 28: 2255]. Some of the plants so raised were found to be free from crinkle virus, and probably also from vein chlorosis virus, whereas these viruses had persisted in entire plants kept at 37° C. for up to 40 days. The size of the cuttings and the rooting medium (peat, coarse sand or a mixture of the two) had little effect on the percentage rooting of the disc cuttings. These results indicate that even those viruses which have so far proved resistant to heat treatment may be eliminated from future propagation stocks by sectioning the crown after treatment.

3542. SCHÖNIGER, G.

Anatomische Veränderungen in den Blattstielen von *Fragaria vesca* L. als Folge der Infektion mit dem Erdbeernekrosevirus. (**Anatomical changes in the petioles of *Fragaria vesca* resulting from infection by the strawberry necrosis virus.**)

Naturwissenschaften, 1958, 45: 397, bibl. 1, illus.

Causing blockage in translocation of nutrients and assimilates.

3543. HOPP, H.-H.

Zum Stand der Übertragbarkeit von Rebviren. (**Our present knowledge of the transmission of vine viruses.**)

Weinberg u. Keller, 1959, 6: 9-17, bibl. 30, illus.

A review.

3544. OCHS, G.

Untersuchungen über den Wirtspflanzenkreis von drei Rebenviren. (**Studies on the hosts of three vine viruses.**)

Naturwissenschaften, 1958, **45**: 370, bibl. 2.

Die Wirte des Deformations-, Jaune canare- und Panaschürevirus der Rebe. (**The hosts of infectious degeneration, yellow mosaic and panachure viruses of the vine.**)

Gartenbauwiss., 1959, **24**: 214-19, bibl. 34.

Thirty-six plant families with 82 species were found to be hosts of the panachure virus. One family with 17 species harboured the yellow mosaic virus, while the infectious degeneration virus occurred in 3 families with 11 species. The hosts of the panachure virus are of practical importance as they include 11 indigenous weeds of vineyards and 10 cultivated species used for intercropping in the vineyards of southern countries.—Bot. Inst. Univ. Freiburg i. Br.

3545. GÄRTEL, W.

Die "flavescence dorée" oder "maladie du Baco 22 A". (**The flavescence dorée [golden yellowing] or Baco 22 A disease of vines.**)

Weinberg u. Keller, 1959, **6**: 295-311, bibl. 19, illus.

An account is given of the symptoms of this virus disease of vines seen in south-west France, which is particularly marked on the hybrid Baco 22 A. The author concludes that it is the same as that seen in several German wine-growing districts, and that it is probably the most serious virus disease of vines known in Europe. What makes it particularly dangerous is the rhythm of its action: crisis, apparent recovery and renewed attack; this means that a stock may often show no symptoms and yet be seriously infected.

Bacteria.

(See also 3267.)

3546. STAPP, C.

Der "Feuerbrand" der Obstgehölze—Gefahr seiner Einschleppung nach Deutschland. (**Fire blight of fruit trees—the danger of its introduction into Germany.**)

NachrBl. dtsh. PflSchDienst., Braunschweig, 1960, **12**: 33-7, bibl. 25, illus.

A review of symptoms, prevention and control.

3547. BILLING, E., CROSSE, J. E., AND GARRETT, C. M. E.

Laboratory diagnosis of fire blight and bacterial blossom blight of pear.

Plant Path., 1960, **9**: 19-25, bibl. 11, illus.

On the basis of experience in 1958 and 1959 a recommended procedure is given for the expeditious laboratory diagnosis of fire blight [*Erwinia amylovora*] and bacterial blossom blight [*Pseudomonas syringae*] of pear. The isolation and recog-

nition of the causal organisms with confirmatory pathogenicity, biochemical and phage-sensitivity tests are described in detail. [Authors' summary.] —N.A.A.S., Wye, and E. Malling Res. Stat., Kent.

Fungi.

(See also 3393-3396, 3410, 3612, 4614, 4629.)

3548. CIFERRI, R.

La campagna anticrittogamica del 1958. (**The fungus control campaign of 1958.**) [English summary $\frac{1}{2}$ p.]

Not. Mal. Piante, 1959, No. 49/50, pp. 101-5.

The success of zineb against downy mildew of vines was confirmed, but a copper fungicide was necessary for the final treatment of the season. Apple scab was again successfully controlled by zineb or ziram at 300 g./hl., and apple mildew by Karathane at 100 g./hl. mixed with zineb at 50 g./hl., but not by sulphur. Ziram was successful against most fungus diseases of stone-fruit trees. Peach mildew in some cases failed to respond to sulphur treatment. Sooty moulds and leaf spot (*Cycloconium*) of olives were controlled by zineb, the former only temporarily unless the conditions favouring their return were changed. Most of the fungus diseases of tomatoes were controlled by mixtures of zineb and ziram, but leaf spot (*Septoria lycopersici*) was best controlled by copper fungicides. Zineb proved very effective against fungus diseases, particularly rusts, of ornamental plants, and its use on vines and fruit trees reduced attacks of red spider mites.

3549. BOTTING, G. W.

Armillaria root rot kills trees both young and old.

J. Agric. S. Aust., 1959, **63**: 11-15, illus.

When replanting infected orchards, the ground should be deeply ripped to bring old roots to the surface for collection and burning, and an interval of 2-3 years given to permit smaller roots to rot. Soil fumigation with carbon disulphide is also recommended. In existing orchards infected trees and those in their vicinity should have their butts exposed by blowing out a basin with a high pressure water jet, and any infected roots should be completely removed. Vigorous growth and good drainage help in preventing the spread of this fungus.

3550. MOORE, M. H., AND BENNETT, M.

Experiments on the control of apple canker by spraying.

A.R. E. Malling Res. Stat. 1959, 1960, **A43**: 85-91, bibl. 16, illus.

A series of experiments extending over several seasons on the susceptible M.VIII apple rootstock showed that the incidence of apple canker (*Nectria galligena*) could be greatly reduced by 2 copper sprays applied in autumn, the first before the main

leaf-fall period has started and the second at about 50% leaf-fall. At least one further application is advisable in spring when the buds begin to swell, especially for localities of high spring rainfall. Where a severe epidemic already exists, this spray programme must be supplemented by thorough excision of the old cankers, preferably between the autumn and spring sprays. [Authors' summary.]

3551. GAYNER, F. C. H.

Results with an effective treatment for apple canker.

Comm. Gr., 1960, No. 3345, p. 339, illus.

P.P. Liquid Mercury Plus gave better control if the canker was first cleaned, ideally by paring away the dead tissue or by using a wire brush to remove it. Recovery rates of 80-97% have been obtained.—Fernhurst Res. Stat.

3552. UITTERLINDEN, L.

Welke schade kan een aantasting van appel-meeldauw veroorzaken? (How much damage is caused by an attack of mildew?)

Fruittelct., 1960, 50: 183.

Figures are given from a trial with Jonathan apples showing that uncontrolled mildew infection did not affect yields in the same year, but that in the year following the attack the affected trees yielded 14,200 kg./ha. less than the trees that had been sprayed to control the mildew. In the year of attack fruit from the unsprayed trees was of poorer quality than that from sprayed trees.—R.T.C., Barendrecht.

3553. BURCHILL, R. T.

The rôle of secondary infections in the spread of apple mildew (*Podosphaera leucotricha* (Ell. and Ev.) Salm.).

J. hort. Sci., 1960, 35: 66-72, bibl. 6.

The infection of leaves in the field and the effects of the host and of climatic conditions on the subsequent spread of apple mildew are described. During periods of low rainfall in the summers of 1956 and 1957 new secondary infections increased, but with a higher rainfall there was a corresponding reduction in the number of such attacks. Records of the spread of secondary infections in the field have provided quantitative data establishing that such infections have a significant bearing on the amount of mildew arising in the following season as primary infection. The rôle of the late infection of terminal buds in the overwintering of the fungus is discussed in relation to recent changes in pruning techniques. The tipping of all leader growths over 6 in. long reduced the mildew level in the early summer of the succeeding year to approximately 10-20% of that on trees not thus treated. [For earlier work, see *H.A.*, 29: 249.] [Author's summary.]—E. Mallng Res. Stat., Kent.

3554. NIENHAUS, F.

Das Wirtsspektrum von *Phytophthora cactorum* (Leb. et Cohn) Schroet. (The host range of *Phytophthora cactorum*.) [English summary 10 lines.]

Phytopath. Z., 1960, 38: 33-68, bibl. 279.

A review and a study of 39 weed hosts.

3555. GREENFIELD, I.

Mercury spray programme saves £23 an acre.

Grower, 1960, 53: 657-8.

KINGSTON, H. I.

The economics of apple scab and mildew control.

Comm. Gr., 1960, No. 3346, p. 399, illus.

In field trials over 3 years Sulpham, containing 0.6% Phelam and 60% sulphur, in 5 applications (2 pre-blossom and 3 post-blossom) at 300 gal. (15 lb. Sulpham) per acre, gave virtually complete scab control and also good mildew control. In other trials Sulpham, at the same rate, gave scab control equal to captan and mildew control only slightly inferior to Karathane. In both series of trials mite populations were also reduced. A spray programme using Phelam at 1 lb. per 100 gal. as a pre- and post-blossom scab spray, with Sulpham used only for the 5 critical mildew sprays, would be more economical than one using Sulpham throughout the season. Using a 10-spray programme of 5 Phelam plus 5 Sulpham applications, the cost would be £13 per acre for materials, compared with £23 for 10 captan sprays, or £35 if Karathane was also used.

3556. LIEBSTER, G.

Erlaubt die kurative Schorfbekämpfung (Stoppspritzung) Einsparung an Spritzmitteln? (Does the curative control of scab permit of a saving in chemicals?)

ErwObstb., 1960, 2: 68-70, bibl. 2.

In the summer of 1959 it was found that a reduction in the concentration of sprays to $\frac{1}{2}$ or $\frac{1}{4}$ did not affect apple scab control, provided that the timing was correct and that the recognized mercurial fungicides were used.—Inst. Obstb., tech. Hochsch., München.

3557. BÖMEKE, H.

Wie können wir die Gesetzmässigkeit in der Entwicklung des Schorfpilzes für den Warn-dienst nutzbar machen? (How can the natural laws governing the development of the scab fungus be utilized for the warning service?)

Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 163-6, bibl. 2.

A condensation of the author's investigations and observations at Jork over the past 9 years.

3558. GERRITSEN, J. D.

Telefonische waarschuwingdienst voor de fruitteelt. (**Telephone warning service for fruit culture.**)

Meded. Dir. Tuinb., 1959, **22**: 617-19.

Daily warnings given for scab control, etc., by an automatic answering machine at the R.T.C., Geldermalsen.

3559. LHOSTE, J.

Sur l'efficacité du Carbatène utilisé seul ou associé au cuivre contre la tavelure du poirier et le mildiou de la vigne. (**The efficiency of Carbatene used alone or with copper against pear scab and vine mildew.**)

C.R. Acad. Agric. Fr., 1959, **45**: 883-9, bibl. 6.

This new fungicide, which is a compound formed from the mono- and disulphides of polyethylene bis thiuram, was compared with zineb, captan, ziram and bordeaux mixture. Carbatene alone (at 225 or 180 g./hl.) compared favourably with the other compounds against pear scab but a mixture (at 300 or 400 g./hl.) of Carbatene + copper oxychloride was more effective against vine downy mildew.

3560. BEREND, I.

Néhány új adat a kajsziarackfák irreverzibilis hervadásos (verticilliosis), állati kártevőktől származó és fagyás eredetű hirtelen pusztulásához. (**New data on the sudden death of apricot trees caused by irreversible wilting (verticilliosis), animal pests and frost.**)

Magy. tud. Akad. Agrártud. Oszt. Közl., 1959, **14**(1-3): 135-44, from *Hung. agric. Rev.*, 1959, **8**, Abstr. 304.

Symptoms typical of apoplexy in apricots may be caused by wilt (*Verticillium dahliae*) usually found in association with *Fusarium oxysporum*, by the larvae of *Capnodis tenebrionis* or *Perotis lugubris* which attack the roots, or by latent frost injury to the cambium.

3561. WISHART, R. L.

Apricot gummosis.

J. Agric. S. Aust., 1959, **63**: 110-19, bibl. 6, illus.

Infection by *Eutypa* sp. and the symptoms caused are illustrated and described. Control can only be obtained by reducing all possible sources of infection. Infected wood should be burned immediately, and a modified system of pruning adopted, whereby the number of wounds, through which the disease might enter the tree, is considerably reduced. All wounds should be disinfected with gentian violet and sealed with grafting mastic or grafting wax, and pruning instruments should be disinfected after use on each tree in a

5% formalin solution. [For an earlier report see *H.A.*, **28**: 3503.]

3562. RJABOV, I. N., RJABOVA, A. N., AND GUF, Z. V.

A study of the degree of resistance to leaf curl in peach varieties. [Russian, with English summary.]

Bjull. nauč. Inf. Gos. Nikitsk. bot. Sad., 1957, No. 5-6, pp. 25-8, from *Ref. Ž. (Biol.)*, 1958, No. 19, Abstr. 87,230.

Of 378 varieties observed between 1951 and 1956 none was completely resistant. Amsden was among the more resistant varieties, and Golden Jubilee, Rochester, Large Early Mignon and Jubilee showed moderate resistance. Elberta and Carmen were among the very susceptible varieties.

3563. GROSCLAUDE, C., AND SIMONE, J.

Essais de quelques fongicides organocupriques dans la lutte contre la cloque du pêcher. (**Trials of some organo-copper fungicides for the control of peach leaf curl.**)

Phytiat.-Phytopharm., 1959, **8**: 103-7, bibl. 1.

Ziram-copper (15% ziram plus 33% copper as basic sulphate), at 0.5% of the commercial product, gave results equal, or slightly inferior, to bordeaux. Zineb-copper was unsatisfactory.—*Stat. Path. vég. Sud-Ouest, Pont-de-la-Maye.*

3564. GROSJEAN, J.

Een oplossing voor het loodglansvraagstuk in zicht? (**Is a solution to the silver leaf problem in sight?**)

Fruittelt., 1960, **50**: 184-6.

Preliminary experiments have shown that silver leaf (*Stereum purpureum*) infection is associated with the availability of iron. Five infected plum trees, growing on a soil of pH 7, were treated on 20 August, 1957, with a soil application of 100 g. iron sulphate + 125 g. salicylic acid in 2 kg. moist sand per tree. The treatment was repeated 5 times up to 16 June, 1958. A great improvement was observed in 4 of the 5 trees, and after a further year's treatment 2 of the trees appeared to be completely cured. Similar treatment also markedly reduced silver leaf symptoms after 1 year in 4 out of 5 other infected plum trees. The experiments are to be continued on a larger scale. To reduce the danger of silver leaf, growers are recommended to plant on a soil with a pH of 6 or less.—I.P.O., Wageningen.

3565. BOLAY, A.

La lutte contre la rouille du cassis. (**Black currant rust control.**)

Rev. hort. Suisse, 1960, **33**: 120-3, bibl. 6, illus.

Although zineb provided the most effective control of rust (*Cronartium ribicola*), copper fungicides were satisfactory and were also useful for oidium

control. A schedule of 0.5% copper oxychloride before and after flowering, and zineb, 0.2%, at ripening, after harvest and in mid-August is recommended.

3566. JACOBS, R. H.

Versuche mit Karathane und Netzschwefel im Weinbau. (Experiments with Karathane and wettable sulphur in vineyards.)

Weinberg u. Keller, 1959, 6: 53-6.

For the control of powdery mildew of vines 0.05% Karathane proved superior to 0.1% wettable sulphur. Karathane had a rapid action and it aided the normal maturation of most berries on infected vines.

Nematodes.

3567. LOWNSEBURY, B. F., AND THOMASON, I. J. Progress in nematology related to horticulture.

Proc. Amer. Soc. hort. Sci., 1959, 74: 730-46, bibl. 145.

A review.

3568. MAI, W. F.

Growth of apple seedlings in relation to soil temperature and inoculation with *Pratylenchus penetrans*.

Phytopathology, 1960, 50: 237-8, bibl. 4.

In general both root and top growth of apple seedlings were directly correlated with temperature in the range from 45° to 85° F. Inoculation with *Pratylenchus penetrans* significantly reduced growth at all temperatures, the reduction, particularly of roots, being greatest at 85° F. and least at 45° F. —Cornell Univ., Ithaca, N.Y.

3569. WARREN, L. E.

Response of peaches and walnuts to nematode control.

Down to Earth, 1959, 15(3): 10-13, bibl. 6, illus.

Infested walnut trees treated with 1,2-dibromo-3-chloropropane by both soil injection and irrigation showed renewed vigour, and the nematode population of the soil was effectively reduced. Similar results were obtained when peach trees were treated with either ethylene dibromide or 1,2-dibromo-3-chloropropane in irrigation water.

Mites.

(See also 3410, 3585, 3595, 3596, 3614, 4597, 4614, 4625.)

3570. DENT, R. G.

Bryobia mite—control in orchards.

J. Agric. S. Aust., 1959, 63: 158, illus.

The life history of *B. praetiosa* and the damage caused are described. Complete control of eggs and adults may be obtained with 1 treatment of Trithion at 1 lb./100 gal. or with Gusathion at 2 lb./100 gal. applied at 3-week intervals or malathion at

2 lb. w.p. or 1 pt. emulsion/100 gal. at 2-week intervals. Ovotran, PCPBS, Chloroparacide and Kelthane are also effective.

3571. CHABOUSSOU, F., AND RAMADIER, P.

Essais de traitements de plein champ contre les oeufs d'hiver de tétranyques sur les arbres fruitiers. (Trials of field treatments against winter tetranychid eggs on fruit trees.)

Phytiat.-Phytopharm., 1959, 8: 131-40, bibl. 15.

For early applications in mid-February a mixture of 80% oil and 1.5% parathion was more effective against eggs of *Bryobia rubrioculus* and *Panonychus ulmi* than oil with 3% parathion, or than yellow oil (containing 5% DNOC) used at 3%. Results were best when spraying was done as close as possible to bud burst. Under these conditions yellow oil at 4% caused nearly total destruction of the eggs. On pome-fruit trees oil-parathion should be applied at the bud opening stages C and D, but with stone-fruit trees it should be applied at stage B. Although no phytotoxicity has been observed, the author advises that the spraying of peaches with oil-parathion should be done when the buds are just swelling.—Stat. Zool. agric. Sud-Ouest, Pont-de-la-Maye.

3572. CLEVELAND, M. L.

Soil injection as a means of applying systemic acaricides to fruit trees.

J. econ. Ent., 1960, 53: 144-6, illus.

A way to curb mites.

Agric. Res. Wash., 1959, 8(6): 16.

In 1957 the injection of 6 gal. of water containing 9 oz. of demeton, phorate (Thimet) or Chipman R-6199 (0,0-diethyl S-(2-diethylamino)-ethyl phosphorothioate [hydrogen oxalate salt]) into the soil under each mature Grimes apple tree gave promising control of two-spotted spider mites (*Tetranychus telarius*) and European red mites (*Panonychus ulmi*). Further work in 1958 on 4 apple varieties at 2 locations showed phorate to be particularly effective when applied by this method. Illustrated descriptions are given of an air-pressure injector and a water-pressure injector.—Agric. Res. Serv., U.S.D.A., Vincennes, Ind.

3573. VAN DE VRIE, M.

Die Bekämpfung der Obstbaumspinnmilbe (*Metatetranychus ulmi* Koch) um die Blütezeit der Apfelbäume. (The control of the fruit tree red spider mite on apples before and during flowering.) [English summary 32 lines.]

Reprinted from *Verhandl. IV. int. PflSch.-Kongr. Hamburg 1957*, Braunschweig, 1959, Vol. 1, pp. 651-4, bibl. 6.

By controlling the larvae emerging from the winter eggs by means of ovo-larvicides, the use of organic phosphoric esters can be restricted. To control the winter eggs mineral oil can be used, and to

control the hatching larvae PCPBS and chlorbenside. Applications of mineral oil sometimes damage the trees and are rather expensive. PCPBS and chlorbenside are not phytotoxic when applied before blossoming; on some varieties, however, PCPBS damages the fruits when applied after blossoming. A single application of PCPBS or chlorbenside shortly before or just at the beginning of the flowering period can give very good results. [From author's summary. See also *H.A.*, 30: 448.]

3574. MADSEN, H. F., AND WESTIGARD, P. H.
Resistance to acaricides by European red mite studied in Bartlett pear field plots.
Calif. Agric., 1960, 14(2): 7-8, illus.

Resistance to ethion and Tedion, with and without Glyodion and oil.

3575. PUTMAN, W. L., AND HERNE, D. C.
Effects of Sevin on phytophagous mites and predators in an Ontario peach orchard.
Canad. J. Plant Sci., 1960, 40: 198-201, bibl. 5.

Numbers of the European red mite (*Panonychus ulmi*) increased, but those of the brown mite (*Bryobia arborea*) and the peach silver mite (*Vasates cornutus*) decreased, after sprays of Sevin were applied to peach trees. Sevin practically eliminated the predacious mite *Typhlodromus rhenanus* and larvae and pupae of *Stethorus punctillum*, and greatly reduced the numbers of adults of *S. punctillum*, chrysopid larvae and spiders. [From authors' abstract.]-Dep. Agric., Vineland Stat., Ont.

3576. MERINO M., G., AND VÁZQUEZ A., V.
Combate del ácaro del duraznero (*Tetranychus telarius* L.) mediante acaricidas en Ecuador. (Control of the peach mite (*Tetranychus telarius* L.) by acaricides in Ecuador.)
[English summary 9 lines.]
Turrialba, 1959, 9: 51-3, bibl. 3.

The rapid initial action of Sulforon X (wetable sulphur) was combined with the greater effectiveness and persistence of Tedion V-18 (2,4,5,4'-tetrachlorodiphenylsulphone) by mixing 5 lb. of the former and 1 lb. of the latter in 400 l. of water. Malathion gave poor results alone. In combination with Sulforon X it was moderate, and with Tedion V-18 it gave good control, but judging by the mite populations 30 days after treatment, Suforon X + Tedion V-18 gave the best results.

3577. BRAVENBOER, L.
De chemische en biologische bestrijding van de spintmijt *Tetranychus urticae* Koch. (The chemical and biological control of the glasshouse red spider mite.) [English summary 8 pp.]
Publ. Proefst. Groent. Fruit. Glas. Naaldwijk 75, 1959, pp. 85, bibl. 125, illus., f. 3.30.

Several factors, among them the development of resistance to acaricides, have rendered the chemical control of *Tetranychus urticae* very difficult in glasshouses devoted to fruit growing. The liberation of the predators *Stethorus punctillum* and *Typhlodromus longipilus*, combined with a single annual application of a selective acaricide, is recommended as giving adequate control of the mite.

3578. RAJKOV, E., AND NAČEV, P.
Vine mite—*Brevipalpus lewisi*. [Bulgarian.]
Bull. Plant Prot., Sofia, 1957 (issued 1958), 6(3): 58-68, illus.

The vine mite was controlled by spraying with lime-sulphur at 1:10 or 1:5 during the autumn after harvesting and in the spring before bud burst.

3579. FOSCHI, S.
L'acaro giallo. (Yellow mites.)
Ital. agric., 1960, 97: 285-6, illus.

Eotetranychus carpini, the mite which severely damages vines in Italy, is best controlled by spraying with lime-sulphur or with oleoparathion, shortly before bud burst. Treatments with ovicides and acaricides should begin as soon as the females emerge from hibernation (in late May in central and northern Italy).

3580. MATHYS, G., AND TENCALLA, Y.
L'acarien des charmillles (*Eotetranychus carpini* Oudms) dans le vignoble tessinois. (Hornbeam mites (*Eotetranychus carpini*) in the vineyards of Ticino.)
Rev. romande Agric. Vitic., 1960, 16: 29-31, bibl. 4, illus.

Experiments showed that this pest strongly resembled *Panonychus ulmi* in its reactions to acaricides. Its natural predators, *Typhlodromus aberrans*, are killed by the chemicals which most successfully control *E. carpini*, but in cases of severe infestation the predators are already scarce. The first acaricidal treatment should be given at bud burst, and, if *P. ulmi* is also present, a second treatment should be given when the shoots are 5-10 cm. long. Summer populations can be controlled by 2 treatments about 12 days apart.

3581. SMITH, L. M.
Control of red spider mites resistant to standard miticides.
Calif. Agric., 1960, 14(1): 2.

During 1959 the Pacific mite on vines showed increasing resistance to standard acaricides, and research is now in progress to determine whether silica-aerogels [see *H.A.*, 29: 3472] will successfully control this mite. The very fine particles of silicon dioxide absorb the fatty covering of insects, causing them to die of desiccation.—Univ. Calif., Davis.

Insect pests.

(See also 3453, 3560, 3614, 4597.)

3582. DOWNING, R. S.

Sevin as an orchard insecticide in British Columbia.*Proc. ent. Soc., B.C.*, 1959, **56**: 41-5, from *Biol. Abstr., Sect. E*, 1960, **35**, Abstr. 17,334.

Good control of 8 species of insects was obtained from 50% Sevin w.p. applied as follows: 1. Pink bud stage on apple: eye-spotted bud moth (*Spilonota ocellana*) and fruit tree leaf roller (*Archips argyrospila*). 2. Pink bud stage on peach and apricot: scales (*Lecanium coryli* and *L. cerasifex*) and peach twig borer (*Anarsia lineatella*). 3. As 3 or more summer applications on apple: codling moth (*Carpocapsa pomonella*) and apple aphid (*Aphis pomi*). 4. As a summer application on pear: pear psylla (*Psylla pyricola*).—Summerland Res. Stat.

3583. SIMMONDS, F. J.

Biological control—past, present and future.*J. econ. Ent.*, 1959, **52**: 1099-102, bibl. 12.

This review and the two following papers were presented at a symposium on various aspects of biological control of pests, including those of fruit trees, and of weeds.

3584. SMITH, R. F., AND HAGEN, K. S.

Integrated control programs in the future of biological control.*J. econ. Ent.*, 1959, **52**: 1106-8, bibl. 15.

The complementary use of chemical and biological control methods.

3585. PICKETT, A. D.

Utilization of native parasites and predators.*J. econ. Ent.*, 1959, **52**: 1103-5, bibl. 7.

In apple orchards in Nova Scotia the general use of a programme of selective sprays for several years has been followed by a reduction in the amount of damage caused by important pests, including oystershell scale (*Lepidosaphes ulmi*), codling moth (*Carpocapsa pomonella*), eye-spotted bud moth (*Spilonota ocellana*), apple aphid (*Aphis pomi*), rosy apple aphid (*Anuraphis roseus*), and European red mite (*Panonychus ulmi*). Evidence indicates that, when selective pesticides were applied, beneficial species survived in greater numbers, and in some cases increased substantially. [From author's abstract.]

3586. BONNEMAISON, L.

Le puceron lanigère du pommier: biologie et méthodes de lutte. (The woolly aphid of apple trees: biology and methods of control.)*Pomol. franç.*, 1959, **1**(11): 10-11, illus.

Recommendations include: the use of Merton Immune or Malling-Merton rootstocks; attention to wounds; the growing of standard rather than

short-trunked forms; autumn spraying with anthracene oils, and spring application of oleoparathion at 40-50 g./hl. or BHC at 150-200 g./hl. before flowering, followed by parathion, BHC, lindane, Isolan or nicotine sulphate at the pink-bud stage, and demeton methyl at 50-75 g./hl. at the full leaf stage.

3587. BREakey, E. P.

Control of root weevils in strawberry plantings.*J. econ. Ent.*, 1959, **52**: 1117-19, bibl. 9.

The 3 species primarily responsible for weevil damage to strawberries in Washington are the strawberry root weevil, *Brachyrhinus ovatus*, the rough strawberry weevil, *B. rugostriatus*, and the black vine weevil, *B. sulcatus*. Lindane, aldrin and heptachlor at 2½, 5 and 10 lb. of actual toxicant per acre and chlordane at 5, 10 and 20 lb. were mixed with soil low in organic matter before planting. Five years after the application lindane had become ineffective, chlordane was beginning to fail, and aldrin and heptachlor were still giving control.

3588. JENKINS, C. F. H., AND SHEDLEY, D. G.

The Mediterranean fruit fly.*J. Agric. W. Aust.*, 1959, **8**: 531-42, bibl. 8, illus.

Baiting is recommended, starting 6 weeks before picking, and 3 formulations containing, respectively, malathion with yeast hydrolysate, malathion with sugar, and sodium fluosilicate with sugar are given. Dipterex at 1 pt. liquid concentrate in 120 gal. for stone fruits and at 1 pt. in 60 gal. for pears is considered the most suitable insecticide for cover spraying. The importance of destroying all infected fruit and of fruit fumigation is stressed.

3589. DELANOUÉ, P.

Les plantations de pêcheurs et la mouche des fruits. (Peach plantations and the fruit fly.)*Fruits et Prim.*, 1959, **29**: 160-7, bibl. 12.

New peach varieties are listed and their resistance to fruit flies, particularly *Ceratitis capitata*, is discussed. Methods of control include the use of chemical sprays alone or combined with hydrolysed protein baits, treatment of the soil with insecticides and the release of fruit fly parasites.

3590. BARTOLONI, P., AND ZOCCHI, R.

La lotta contro la *Rhagoletis cerasi* L. in base ad alcune considerazioni sulla sua etologia. (Control of *R. cerasi* based on some aspects of its life cycle.)*Redia*, 1958, **43**: 329-49, from *Biol. Abstr., Sect. E*, 1960, **35**, Abstr. 11,708.

Experiments on the use of single applications of organo-phosphorus insecticides on Durella cherries showed that, to be effective, the application must be made 4 or 5 days after the start of fruit ripening, when almost all the eggs will have been laid. The

insect lays its eggs within a very short period and they will hatch while the insecticide remains toxic.

3591. MONASTERO, S.

Un nemico del pistachio. (**A pistachio pest.**) *Ital. agric.*, 1960, **97**: 223-9, illus.

In Sicily the fruits of pistachio are seriously damaged by the larvae of *Megastigmus pistaciae* (= *Trogocarpus ballesterii*). In a season when 70% of the fruit on control trees was attacked, treatments with Saitofos (30% DDT, 20% malathion, 10% parathion) at 0.1-0.5% or with Didifos (40% DDT, 10% parathion) at 0.25-1% reduced the infestation to 20% and 8%, respectively, and were distinctly profitable commercially. The first treatment should be applied at or immediately before fruit set, and be followed, in cases of moderate infestation, by 2 more at 10-day intervals. To control a severe infestation a 4th, and possibly a 5th application will be necessary, with 15-20-day intervals. All infested or unmarketable fruit should be collected and burnt, because the larvae hibernate in the fruit even when it remains on the tree. The same applies to terebinth fruit, which acts as a reservoir of infestation. The windows of storage chambers should be covered with fine metal gauze to prevent adult flies, emerging in spring from overlooked infested nuts in store, from escaping to attack the next crop.

3592. BERG, W.

Zur Kenntnis der Obstbaumminiermotte *Lyonetia clerkella* L. unter besonderer Berücksichtigung des Massenwechsels während der Jahre 1951 bis 1953. Teil II. (**The fruit tree leaf miner, *Lyonetia clerkella*, with special reference to the mass migration during the years 1951 to 1953. Part II.**) [English summary 30 lines.] *Z. angew. Ent.*, 1960, **45**: 268-303, bibl. 127, illus.

Nikopen, E 605 forte and parathion plus lead arsenate controlled eggs and young larvae.

3593. BERVILLE, P., AND TERRAL, A.

Observations et essais de traitements sur les chenilles bourruées. (**Observations and spraying experiments on hairy caterpillars.**) *Phytoma*, 1958, No. 102, reprinted in *Fruits et Prim.*, 1959, **29**: 138-41.

The appearance and habits of *Arctia caja* and damage done to vines and fruit trees are described. Several insecticides gave effective control of the caterpillars, the best being toxaphene at 750 g. active ingredient per hl.

3594. SOUTH AUSTRALIA DEPARTMENT OF AGRICULTURE, ADVISER IN ENTOMOLOGY.

Codling moth. Pest of apples and pears. *J. Agric. S. Aust.*, 1959, **63**: 38.

Recommended spray programme based on lead arsenate and Gusathion.

3595. LLOYD, N. C.

Pests of apples and pears—recent developments.

Fruit World, Melbourne, 1959, **60**(11): 27, 29.

Investigations on the control of codling moth, light brown apple moth and red spider showed that, whereas codling moth was resistant to DDT, outstanding control of both moths was obtained with Gusathion and Sevin. Gusathion also gave good control of red spider, but Sevin did not. The mammalian toxicity of Gusathion was much higher than that of Sevin, and both left a visible residue of wettable powder. Trithion, malathion, parathion, Delnav and ethion were also tested; all gave good to very good control of codling moth, but with the exception of parathion they were not effective against the light brown apple moth.

3596. ANON.

Yes it's Gusathion.

Comm. Gr., 1960, No. 3350, p. 692.

New spray for apples and pears.

Grower, 1960, **53**: 638.

Gusathion, recently approved for general use in the U.K., is recommended for use against codling moth, red spider and tortrix.

3597. BÖHM, H.

Zur Lebensweise und Bekämpfung von *Carpocapsa dannehl* Obr. (Marlinger Birnwurm) in Österreich. (**On the biology and control of *Carpocapsa dannehl* in Austria.**) [English summary $\frac{3}{4}$ p.] *PflSch. Ber. Wien*, 1960, **23**: 173-86, bibl. 5, illus.

Control of the 2-3-day-old larvae, after they had entered the fruit, was achieved with phosphorous insecticides such as parathion or a parathion-DDT mixture. Diazinon also proved useful. The treatment must be repeated after a 14-day interval. It is too early to ascertain the importance of this pear pest in Austria, but it can already be stated that there are varietal differences in the susceptibility of pears, and that control measures against *C. dannehl* and *C. pomonella* cannot be combined.

3598. RINGS, R. W.

Better, safer insecticide controls oriental fruit moth.

Ohio Fm Home Res., 1959, **44**: 38-9, illus.

Sevin sprayed on peach trees at 2 lb. 50% w.p./100 gal. gave excellent control of the oriental fruit moth and was also effective against the plum curculio, stink bugs and plant bugs, but not against orchard mites. It was more effective and much less toxic than DDT or parathion and could be applied the day before harvest.

3599. IMMIKHUIZEN, E.

Bestrijding van wintervlinder. (Control of winter moth.)

Fruittelt, 1960, **50**: 195-6, illus.

For winter spraying the ammonium salt of DNOC gave more reliable control than a mixture of DNOC and tar oil. The eggs hatch over a long period of 3-4 weeks, starting about 1 April, so at least 2 spring sprayings are necessary in the case of a severe infestation. In field trials on apple trees with 10 insecticides, Gusathion gave the best control of the caterpillars. Phosphoric esters gave a good kill but were less persistent.—PlZiektk. Dienst, Wageningen.

3600. ŠIKRENOV, D.

Fig moth (*Simaethis nemorana* HB.) and its control. [Bulgarian.]

Bull. Plant. Prot., Sofia, 1957 (issued 1958), 6(2): 60-3.

S. nemorana is spreading rapidly in southern Bulgaria and in the Black Sea region and causes extensive damage to fig crops. A single spray in May with 5% DDT gave 100% kill of the caterpillars. *Aethecurus rugifrons* and *Cadurcia costa* are natural parasites of the caterpillars and give up to 80% control in some years.

3601. RAINE, J., AND ANDISON, H.

Chemical control of the raspberry root borer, *Bembecia marginata* (Harr.), on loganberry in British Columbia.

Canad. J. Plant. Sci., 1960, 40: 160-4, bibl. 4, illus.

A single spray of 25% diazinon emulsible concentrate at rates as low as 2 pints per 100 gal. and $\frac{1}{2}$ pint of drench per plant in March, April or October reduced crown infestation from 77 to 4%. May applications of 2 pints per crown reduced infestation to 10%. The following emulsifiable concentrates reduced the infestation to between 0 and 10%: at 1 pint of drench per crown applied in October, lindane at 5 pints, Thimet at 1 pint, or 12008 at 1 pint per 100 gal.; at 2 pints of drench per crown applied in April, Sevin at 8 pints, NC 262 at $\frac{1}{2}$ pint, or Phosdrin at 1 pint per 100 gal. [From authors' abstract.]—Dep. Agric., Victoria, B.C.

3602. D'AGUILAR, J., AND CHERBLANC, G.

Note biologique sur une hepiale: *Korscheltellus lupulinus* L. (Lep. Hepialidae) nuisible aux fraisières de Plougastel-Daoulas (Finistère) et essais préliminaires de lutte chimique. (Biological note on *Korscheltellus lupulinus* damaging strawberry plants at Plougastel-Daoulas and preliminary trials on chemical control.)

Phytiat.-Phytopharm., 1959, 8: 111-15, bibl. 4.

The biology of the insect and the damage caused are described. In laboratory and field trials parathion at 5 kg. a.i./ha., a DDT-lindane mixture at 3.6 and 0.63 kg. a.i./ha. and endrin at 5.8 kg. a.i./ha. gave good control. In this area the treatments should be given at the end of July or at the beginning of August. To achieve success the insecti-

cides should be applied in sufficient water, about 400-500 l./are, to ensure penetration of the upper layer of soil.—Stat. cent. Zool. agric., Versailles.

3603. RUSS, K.

Beitrag zur Biologie und Bekämpfung des Springwurmes (*Sparganothis pilleriana* Schiff.) im niederösterreichischen Weinbauggebiet. (On the biology and control of *Sparganothis pilleriana* in the vineyards of Lower Austria.) [English summary 1 p.] *PflSch. Ber. Wien*, 1960, 23: 129-70, bibl. 16, illus.

In a biological study of *Sparganothis pilleriana* it was found that in Lower Austria the main areas of infestation coincide with the areas that have the most favourable climate for vine growing. Of the dormant sprays tested an oleoparathion preparation proved most successful if applied at temperatures above 10° C. This chemical may be combined with certain sulphur products for the simultaneous control of mites hibernating on the vines. To control young caterpillars of the vine moth in May parathion and DDT sprays were the most effective, but the treatment of hatching larvae in July did not produce results of any practical value. The different life cycles of the pests made it impossible to combine the control of *S. pilleriana* with that of the vine moths.

3604. PHILLIPS, A. M.

Control of hickory shuckworm on pecans.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 97-8.

When 86.1% of the nuts on unsprayed trees were infested, 3 applications of EPN at fortnightly intervals gave good control of shuckworm [*Laspheyresia caryana*] on Mahan pecans, and were more effective than applications of Guthion or Thiodan. With 44.5% infestation of unsprayed Moore trees, 3 applications of EPN gave excellent control and 3 applications of EPN + malathion, each at half strength, gave good control. Promising attractants were selected. [For earlier work see *H.A.*, 29: 301.]

3605. TURNIPSEED, G. F.

Biology and control of the apple seed chalcid in North Carolina.

J. econ. Ent., 1960, 53: 166, bibl. 3.

One application of DDT, malathion or Sevin, in addition to the regular lead arsenate programme, gave effective control of *Torymus druparum* on Golden Delicious trees. [See also *H.A.*, 26: 1602.] —N.C. agric. Exp. Stat., Raleigh.

3606. RIMES, G. D.

Some experiments on San José scale control. *J. Agric. W. Aust.*, 1959, 8: 587-93, bibl. 11, illus.

Large-scale field trials demonstrated that although dormant sprays, such as lime-sulphur followed by

Superior dormant oil, gave good control, it was not sufficient to meet the new phytosanitary export requirements. Of the post-harvest sprays Gushathion at 0.05% plus dormant oil at 3% was the most effective, and summer treatments of parathion, Gushathion and diazinon, all at 0.05% plus a summer oil, gave better control than malathion.

3607. KUITERT, L. C.

Control of flower thrips in strawberries.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 104-5.

Three dust and 5 spray materials were applied to strawberries on April 14 and May 12 for flower thrips control. The best results were obtained with 10% Sevin dust and Sevin spray; these increased yields by 47 and 30%, respectively.

3608. ČAKAROV, K.

Pear tingid (*Stephanitis pyri*) is a dangerous pest. [Bulgarian.]

Bull. Plant Prot., Sofia, 1957 (issued 1958), 6(3): 82-3.

In the Black Sea region a severe infestation of apple and pear trees by *S. pyri*, causing complete defoliation, is reported to have done more damage in the last few years than scab. Malathion at 300 c.c./100 l. water has given good control of the pest in some districts.

Chemicals and their application.

(See also 3193-3197, 3572.)

3609. MINISTRY OF AGRICULTURE, LONDON.

Crop Protection Products Approval Scheme, Approved List 1959-60. Ministry of Agriculture, Fisheries and Food (Publications), Soho Square, London, W.1, 16th edition, 1959, pp. 64.

A list of insecticides, fungicides and herbicides marketed in Great Britain under proprietary brand names, for the guidance of growers in the purchase of materials. The publication is well indexed and provides much supplementary information.

3610. WAIN, R. L.

Some chemical aspects of plant disease control.

Lectures, Monographs Roy. Inst. Chem. 3, 1959, pp. 21, bibl. 137, illus., 4s. 6d.

A review, with particular reference to the control of fungi.

3611. LIEBSTER, G.

Einfluss der Winterspritzung auf die Frühjahrsentwicklung von Apfel- und Birnbäumen. (The effect of winter washes on the development of apple and pear trees in the spring.)

Anz. Schädlingsk., 1959, 32: 134-6, illus.

The 9 winter washes tested did not significantly affect the time of bud burst, the time of flowering or the amount of leaves present at the beginning of

flowering. Thus, winter washes do not offer any hope of delaying the development of apples and pears in spring and of thereby avoiding frost damage.—*Inst. f. Obstb., tech. Hochsch. München, Weihenstephan*.

3612. VAN DIJKE, J. F.

Bepalen de neveninvloeden de waarde van het spuitprogramma? (Do the side effects of a spray programme determine its value?)

Fruitteelt, 1960, 50: 259, 261, 263.

Six spray programmes were tested during 1 season for the combined control of scab and mildew, and the effects were studied on the yield, fruit size, colour and russetting of Golden Delicious, Cox, Goudreinette and Jonathan. In general the best yields were obtained from the use of spray programmes containing Karathane, whereas those containing sulphur resulted in the lowest yields. Fruit size was also unfavourably affected by sulphur in comparison with Karathane. Tuzet greatly increased fruit colour. With Cox the most russetting occurred with SM 55 (captan/sulphur) and the least with Tuzet/Karathane. With Golden Delicious the most russetting occurred with captan/Karathane and Pomarsol (TMTD)/Karathane and the least with SM 55 and Tuzet/Karathane.—R.T.C. Geldermalsen.

3613. BOSCH, E.

Die Beeinflussung der Fruchthaut der Äpfel durch Schorf-Spritzungen mit Kupfer. (The effect of copper sprays used against scab on the fruit skin of apples.)

Schweiz. Z. Obst- u. Weinb., 1960, 69: 157-61, illus.

Observations and experiments show that the copper content of pre-blossom sprays must be kept low to prevent damage to the skin of apple fruits. For the production of quality fruit it is better to spray often at short intervals than to apply a large amount of copper at one time. In post-blossom sprays copper should be dispensed with altogether.—Siegfried Aktiengesellschaft, Zofingen.

3614. ANON.

New wide-action systemic simplifies the spray programme.

Comm. Gr., 1960, No. 3355, p. 982.

After extensive field trials since 1957 Dimecron, a new systemic insecticide based on phosphamidon, has been introduced. The chemical controls apple aphids (including leaf-rolling species and woolly aphid), the active forms of red spider mite, apple sawfly and codling moth. Since it has a persistence of 3 weeks, Dimecron solves the problem of timing the codling moth sprays. The first spray, at 16 fl. oz./100 gal. for high volume or 32 fl. oz./acre for low volume, should be applied at total petal fall and will control sawfly, red spider mite and aphids. The second spray will normally be required in mid-

June, but timing will depend upon the codling moth and red spider situation. A third spray 3 weeks later will only be necessary if codling moth attack is prolonged.

3615. SOMERS, E.

Physical aspects of the efficiency of sprays.

N.A.A.S. quart. Rev., 1959, 11: 68-75, bibl. 36.

Spray impaction and retention, coverage, distribution and tenacity of the deposit discussed.

3616. BYASS, J. B.

Fruit tree spraying. Part 1. How much water is necessary? Part 2. How airspeed affects penetration.

Comm. Gr., 1960, No. 3343, p. 229, and No. 3345, pp. 345-7, illus.

Low and high volume sprays do not differ markedly in their effect and both have their place. It will be some time before growers can be assured of adequate control at low volume under all conditions, and there may always be a need for a high volume application in the case of a particular infestation or where a material is unsafe in more concentrated form. The acreage sprayed in a given time can be doubled by changing from high to low volume, and can be increased by a further 30-50% with concentrate spraying. The indications are that low air speeds in the spray nozzles will generally be more efficient than high, but by an amount which varies with working conditions. For any given air speed penetration depends on the volume of air per foot travelled. In a visual assessment of spraying machine performance 3 points have shown up: (1) a spray always goes further than can be seen and the lower the liquid output the greater is this effect; (2) the distance which a fine spray can be made to travel is no measure of its ability to penetrate a tree; (3) the range of a spray increases as the driving speed is reduced.—N.I.A.E., Silsoe, Beds.

3617. NORDBY, A.

Fordelingen av plantevernmidde ved tåke-sprøyting av fire meter høge epletre. (**The distribution of plant protection chemicals in mist spraying apple trees four metres high.**) [English summary 1 p.]

Meld. norg. LandbrHøgsk., 1959, 38(11): 1-14, bibl. 2.

A 2% nigrosine dye was sprayed at 14.25 gal./acre onto compact trees of the variety Filippa, 4 m. high, 5 m. in width. A comparison was made between 3 machines, namely the R.S.M. (Sigvardt) one-sided, the R.S.M. two-sided and the Tomal Atom, at two driving speeds. Polythene was used as artificial leaves, pieces 2 cm. by 2 cm. being placed on various parts of the tree. The spray deposit was estimated by washing the polythene and measuring the amount of nigrosine by a colorimeter.

There was a strong positive correlation between the amounts of nigrosine deposited on apple leaves and on the polythene. The greatest amount of nigrosine was deposited by the R.S.M. one-sided machine, which also produced the most uniform distribution in relation to tree height. With the R.S.M. two-sided machine a somewhat better distribution was obtained when the quantity of the spray directed to the lower part of the tree was reduced. With this machine and even more with the Tomal Atom the amount of nigrosine deposited decreased with height. There was no difference in the total amount of nigrosine deposited on the two halves of the same leaf surface, but there was a marked tendency for larger deposits of nigrosine to occur on the upper than on the lower surface of the leaves, particularly inside the tree crown. Much less nigrosine was deposited on the inner part of these compact trees than on the outer part.

3618. KONLECHNER, H., AND MAYER, N.

Traktor Sattelspritze "Konzentrator II" "Sprühkonzentrator IIR". (**The tractor-mounted sprayer Konzentrator II modified and re-named Sprühkonzentrator IIR.**)

Mitt. Klosterneuburg, Ser. A, 1959, 9: 11-23, illus.

The sprayer (Konrad Rosenbauer KG. Linz/Donau) was successfully tested in vines trained on a high trellis.

3619. PARISI, L.

Prove di una nuova impolveratrice elettrostatica. (**Tests with a new electrostatic duster.**)

Frutticoltura, 1960, 22: 89-90, illus.

The 'Baby-electroduster', designed by a West German firm, has given promising results in the protective treatment of vines, olives, poplars, etc., in Italy. The positive charging of the dusts ensures their thorough, uniform, and economic coverage of the plants treated, including the lower surfaces of the leaves.

3620. HARTLEY, G. S.

The role of surface-active substances in the application of pesticides.

Chem. Ind. Lond., 1960, No. 17, pp. 448-52, bibl. 10.

A general account covering basic and applied aspects.

3621. EICHENBERGER, J.

Über den Einsatz von chemischen Pflanzenschutzmitteln im Obstbau und die Frage der Bedeutung der Spritzrückstände für die menschliche Gesundheit. (**The use of plant protective chemicals in orchards and the significance of spray residues for human health.**)

Schweiz. Z. Obst- u. Weinb., 1960, 69: 117-21 139-43, 162-5, 179-86, bibl. 17.

3622. MIOTTO, G., AND MARTINI, A.
Concentrazione della poltiglia bordolese e del rame residuo dopo pioggia. (**The concentration of bordeaux mixture and residual copper after rain.**)
Not. Mal. Piante, 1959, Nos. 49/50, pp. 31-5, bibl. 2.

Copper loss from vine foliage treated with bordeaux mixture at 0.33–1.0% averaged 9.89% of the surface deposit when 4.5 mm. of rain fell within 4 days of treatment and when dew formed on each of the 5 nights between treatment and final testing. There was evidence of absorption of copper by the leaf tissues. The frequent use of low-concentration bordeaux mixture is advised.

3623. BERGERET, J.
Le fer et le cuivre dans le cassis. (**Iron and copper in black currants.**)
C.R. Acad. Agric. Fr., 1959, **45**: 893-6, bibl. 7.

In view of the deleterious effects of iron and copper on the quality and flavour of black currant products, trials were made of the effect of washing the fruit after harvesting. In 12 samples of fruit from different sources, varying amounts of copper and iron (up to 55.5% and 43.3% of the totals, respectively), were removed by washing. Much of this contamination was due to fungicide residues in the soil splashing on to the fruit during rainstorms.

3624. ROSS, R. G., AND STEWART, D. K. R.
Mercury residues on apple fruit and foliage.
Canad. J. Plant Sci., 1960, **40**: 117-22, bibl. 9.

The disappearance of mercury from the foliage and fruit of 2 apple varieties sprayed with 3 organo-mercury fungicides was investigated. Most of the initial foliage deposit soon became water insoluble and spore germination tests on the surface of leaves demonstrated a rapid decline in

fungitoxicity. The total amount of mercury on the foliage decreased rapidly in the first 2 weeks after spraying and more gradually in the succeeding 2 months. The application of pre-cover sprays resulted in negligible fruit residues. The average harvest residue of fruit receiving an early cover spray was 0.05 p.p.m., of which the peel, pulp and seeds contained about 41, 57 and 2%, respectively. There were no significant differences between residues in fruit sprayed on different dates. [From authors' abstract.]—Dep. Agric., Kentville, N.S.

3625. MAIER-BODE, H.
Über DDT-Rückstände auf Süßkirschen. (**DDT residues on sweet cherries.**)
Anz. Schädlingssk., 1959, **32**: 181-2, bibl. 4.

More apt to exceed tolerance limits when applied in mist sprays than by conventional methods.

3626. KOIVISTOINEN, P., AND ROINE, P.
Occurrence and disappearance of parathion and malathion residues in vegetables and fruits.
[Finnish summary $\frac{1}{2}$ p.]
Maataloust. Aikakausk., 1959, **31**: 294-302, bibl. 9.

Peas, cucumbers, lettuces, strawberries, black currants, apples, string beans, broccoli and spinach were sprayed with parathion and malathion 2 weeks before normal harvest. Assays of deposits were made immediately after spraying, 3 and 7 days later and thereafter weekly. The half lives of the residues were found to be 1–3 and 1–2 days, respectively. The most persistent residues were found on black currants, on which parathion could be detected 43 days, and malathion 28 days, after spraying. In the preparation of 2 kinds of black currant jam, 30 and 54% of the parathion and 54 and 71% of the malathion were destroyed. Both insecticides were stable for at least 6 months in black currant conserves and also in frozen packs of black currants and spinach.

WEEDS AND WEED CONTROL.

General.

(See also 3583, 3584, 3609, 4622.)

3627. MINISTRY OF AGRICULTURE, LONDON.
Chemical weed control in horticultural crops.
Adv. Leaflet. Minist. Agric. Lond. **476**, 1959, pp. 6.

Types of herbicides and techniques of application.

3628. ROBERTS, H. A.
The use of herbicides in horticulture.
Sci. Hort., 1960, **14**: 55-62, bibl. 11.

A review of the situation in Britain [see also *H.A.*, 29: 380m.]

3629. ALLEN, C. E., AND OTHERS.
Wyoming weed control recommendations 1959.

Circ. Wyo. agric. Ext. Serv. **163**, 1959, pp. 11.
A tabulated summary of cultural and chemical methods of control.

3630. WURGLER, W.
La destruction des mauvaises herbes dans les cultures. (**Weed control in crops.**)
Rev. romande Agric. Vitic., 1960, **16**: 9-24, bibl. 40, illus.

A concise guide to commercial herbicides and their use in field crops, vines, fruit crops and vegetables.

3631. PASTAC, L. A.

L' amino-triazol et la leucophyllie des plantes vertes. (**Amino-triazole and leucophyll in green plants.**)

Reprinted from *Bull. Soc. bot. Fr.*, 1959, Vol. 106, pp. 4, bibl. 5.

From a study of its effect on several plants, including peas and radishes, it is concluded that amino-triazole results in the formation of a colourless compound, leucochlorophyll, in the young leaves and flowers. In the presence of chlorophyllase this leucochlorophyll is at least partially hydrolysed, but when insufficient chlorophyllase is present the white compound predominates over the normal green chlorophyll.

3632. ORTH, H.

Untersuchungen über die Flüchtigkeit des CIPC und anderer Herbizide. (**Studies on the volatility of CIPC and other herbicides.**) [English summary 26 lines.]

NachrBl. dtsh. PflSchDienst., Braunschweig, 1960, 12: 37-44, bibl. 5, illus.

3633. EDWARDS, C. J.

Simazine as a selective weedkiller.

Grower, 1960, 53: 730-1.

To control annual weeds in asparagus, apples, pears, raspberries, black and red currants, gooseberries, roses and ornamental shrubs, 1-1½ lb. simazine per acre is recommended; and 5 lb. per acre is tentatively recommended for use against perennial weeds in all the above crops except asparagus and shrubs.—Chesterford Park Res. Stat., Fisons Pest Control.

3634. FREED, V. H.

What we know about the use of wetting agents with herbicides.

Proc. 11th Calif. Weed Conf., 1959, pp. 43-9.

See *Weed Abstr.*, 9, No. 180.

3635. DANIELSON, L. L.

A granular herbicide distributor for small experimental plots.

Crops Res. Rep. U.S. Dep. Agric. ARS-34-11, 1960, pp. 6, illus.

A hand-propelled distributor for broadcast or band application is described and illustrated, and performance data and construction details are given. The basic metering device is an auger which turns in an aluminium tube slotted alternately on the top and bottom.—*Weed Abstr.*, 9, No. 740.

3636. ANON.

The portable logarithmically diluting field plot sprayer after van der Weij.

Int. Pap. Inst. biol. scheik. Onderz., Wageningen, [undated], pp. 7.

Full descriptions are given of the standard (2 m. boom) model and of a 1.20 m. boom model

especially suitable for [weed control experiments in] horticulture. Lists of component parts are included, also directions for use.—*Weed Abstr.*, 9, No. 412.

3637. SWEETMAN, I. C.

A simple conversion of a standard precision sprayer for logarithmic spraying.

Proc. 12th N.Z. Weed Control Conf., 1959, pp. 11-16, bibl. 3, illus., reprinted in *Pest Abstr. News Summ., Sect. C*, 1960, 6: 1-8, bibl. 3, illus.

See *Weed Abstr.*, 9, No. 413.

Specific weeds.

(See also 3664-3666, 3686, 4423, 4492.)

3638. CHANCELLOR, R. J.

Identification of seedlings of common weeds.

Bull. Minist. Agric., Lond. 179, 1959, pp. 72, bibl. 7, illus., 4s. 6d.

A short key to groups is followed by a list and then by illustrated descriptions of seedlings of 87 species of broad-leaved weeds commonly found in Britain.

3639. BROWN, A. G.

Mistletoe control on a large scale.

J. Aust. Inst. agric. Sci., 1959, 25: 282-6, bibl. 3, illus.

A rapid method for large scale injection of 2,4-D for control of mistletoe (*Ameyma* spp.) on eucalyptus trees is described in detail. The dosage was determined directly by the use of a modified Biltmore stick, and cuts were made with a special narrow axe to receive the dose, which was applied with a drenching gun. Possible sources of error in this procedure and ways of minimizing them are discussed.

3640. KHANNA, D. V.

Water hyacinth must be controlled.

Indian Fmg, 1959, 9(8): 8-9, illus.

Maximum control was obtained using Dicotox (ethyl ester of 2,4-D) or Fernoxone (sodium salt of 2,4-D) in water at 5,000 p.p.m., or Dicotox in kerosene at 3,000 p.p.m. It was estimated that 200 gal. of water or 150 gal. kerosene were required to spray an acre of water infested with water hyacinth. Oils give more complete coverage than water, and Dicotox in oil is less harmful to fish than it is in water.

3641. WATSON, K. A.

Herbicide trials on *Imperata cylindrica*.

Pest. Abstr. News Summ., Sect. C, 1959, 5: 144-7, bibl. 2.

Dalapon at 6 lb./ac. and above killed all top growth and prevented regrowth during the following wet season. Amino triazole and monuron + dalapon were unsatisfactory.—Reg. Res. Stat., Samaru, N. Nigeria.

3642. LEVI, E.

Chemical control of *Typha angustifolia* var. *brownii*.

Weeds, N. York, 1960, 8: 128-38, bibl. 13.

The ethyl ester of 2,4-D at 6 lb./ac., in an emulsion containing 22% non-phytotoxic oil, gave good control of *Typha* in irrigation channels. The treatment was more effective when applied at the 5-7-leaf stage than at the flowering stage, and optimum control resulted when the water level was maintained at 3 ft. after application. In drainage channels with variable water levels a spring application of amitrol at 36 lb./ac. or dalapon at 30 lb./ac. gave better control than 2,4-D at 6 lb./ac.—*Irrig. Res. Stat., Griffith, N.S.W.*—From *Weed Abstr.*, 9, No. 542.

Weed control in temperate fruit crops.

(See also 3410, 3630, 3633, 3677, 3680, 4623, 4625, 4630, 4631.)

3643. PEARCE, G. A., AND HARDISTY, S. E.

Weed Research. 5. Weed control in orchards.

J. Agric. W. Aust., 1959, 8: 613-17, illus.

Where cultivation is undesirable, the use of dalapon at 10 lb. of 85% per acre, CMU at 2-4 lb. per acre, amitrol at 10 lb. of 50% per acre or PCP at 10 lb. per acre is recommended, the choice depending on the time of year and type of weed.

3644. MULDER, A.

Bestrijding van onkruiden in boomgaarden met chemische middelen. (Chemical weed control in orchards.)

Fruiteelt, 1960, 50: 189, 188.

Recommendations for control of annual weeds with simazine, PCP in oil, DNOC and herbicidal oils, and of biennials and perennials with dalapon and other herbicides.

3645. WOOD, C. A., AND SUTHERLAND, J. P.

Herbicides for the commercial fruitgrower.

Scot. Agric., 1960, 39: 214-18, bibl. 5, illus.

Suggestions for the chemical control of weeds in Scottish-grown raspberries, strawberries, black currants, gooseberries, apples and plums.

3646. HOLLOWAY, R. I. C.

Couch control under stone fruit.

Proc. Dalapon Symposium, London, 1959, pp. 22-3.

Couch grass in itself does not appear to be a particular problem in either cherry or plum orchards. In plums there may be some scope for chemical weed control, if it can be achieved cheaply and if the herbicide used will kill both broad-leaved weeds and grasses. In a small trial on apples dalapon at 5 and 7 lb./ac. applied round the base of 10-year-old trees in July caused some peripheral leaf necrosis and appeared to affect blossom production. A case is reported where dalapon

applied to the base of Cox on 2 different rootstocks did not affect trees on M.II but injured those on M.I, which has a higher proportion of its fibrous roots close to the trunk and nearer to the soil surface.—*E. Malling Res. Stat., Kent.*—From *Weed Abstr.*, 9, No. 664.

3647. DETROUX, L., AND DERMINE, E.

Le désherbage chimique en culture fruitière.

(Chemical weed control in fruit growing.)

Rev. Agric. Brux., 1959, 12: 999-1014, bibl. 2.

An account is given of a trial of several herbicides in an apple orchard. It is recommended that a total herbicide such as simazine should be applied at a moderate rate, the product used being varied from year to year to prevent increase of the weed species most resistant to a particular herbicide, and that this should be supplemented by a local or general application of a "complementary" herbicide such as DNOC in oil solution. Simazine is the best total herbicide, but a high rate of 2.5 kg. active ingredient per ha. may possibly retard tree growth. Monuron and diuron at 4 kg./ha. are promising. [For earlier work see *H.A.*, 28: 1335.]—*Stat. Rech. État Amél. Plantes fruit. maraîch., Grand Manil.*

3648. HOLM, L., GILBERT, F. A., AND HALTVICK, E.

Elimination of rodent cover adjacent to apple trees.

Weeds, N. York, 1959, 7: 405-8, bibl. 4, illus.

Applications of monuron and diuron in the spring at 10 lb./ac. round the base of apple trees gave complete control of vegetation, including *Agropyron repens* and *Poa* spp., for 2 seasons. Among the 150 trees treated, representing 7 varieties and 10 different locations, no damage occurred to trees or to quality and yields of fruit following treatments by diuron at rates up to 60 lb./ac. or monuron at 10 lb./ac. annually for 4 years.—*Univ. Wis., Madison.*—*Weed Abstr.*, 9, No. 64.

3649. ROBINSON, D. W.

The use of dalapon in fruit crops.

Mon. agric. Rep. Minist. Agric. Belfast, 1959, 34: 206-8.

The use of dalapon in bush and cane fruits.

Proc. Dalapon Symposium, London, 1959, pp. 19-21.

For the elimination of couch grass under black currants the application of 8 lb. dalapon per acre in late October or early spring before the bushes are in leaf is recommended. In apple orchards 6 lb. per acre when the couch grass was 4-10 in. high was effective. Injury was caused to gooseberries by the application of 8 lb. per acre in early spring, but the bushes quickly recovered. The rate of application under raspberries should not exceed 4 lb. per acre, but when applied in winter this

controlled meadow grass. Only spot treatment of bad patches should be practised in strawberries, which are sensitive to this chemical.

3650. PORTER, L. A.

Weed control in berry fruits.

Proc. 12th N.Z. Weed Control Conf., 1959, pp. 106-11, and *N.Z. Comm. Gr.*, 1959, 15(4): 13.

A tentative programme, based on experimental results, is suggested for the control of annual weeds in strawberries (var. Talisman), viz. (1) dinoseb 3 lb./ac. or dinoseb/dinosam 2 lb./ac. + diesel oil 20 gal. pre-planting; (2) chlorpropham 2 lb./ac., or 4 lb./ac. with plants protected, TCA 10 lb./ac. 90%, at planting; (3) chlorpropham (as in 2) or 2,4-DB 1.25 lb./ac. with plants established; (4) 2,4-DES 6-8 lb./ac. immediately pre-mulching and post-harvest; (5) dinoseb 3 lb./ac. or chlorpropham 4 lb./ac. alone or combined during dormancy. Chemicals did not completely eliminate hand hoeing. Two winter applications of amitrol 6 lb./ac. or dalapon 6 lb./ac. gave temporary control of *Agropyron repens* in raspberry canes (var. Lloyd George and Taylor). Amitrol caused yield reduction in the Lloyd George variety. Chemical soil preparation using methyl bromide and plastic sheet mulching for strawberries is being investigated and also dinoseb/dinosam + diesel oil, chlorpropham and dalapon for weed control at the base of stools in raspberries.—*Hort. Res. Stat.*, Levin.—*Weed Abstr.*, 9, No. 259.

3651. VAN OORSCHOT, J. L. P., AND VAN STAALDUINE, D.

The use of herbicides in strawberries.

Rep. Inst. biol. scheik. Onderz., Wageningen, 1959, pp. 2.

Materials and rates used and varietal responses of newly planted and established strawberries.—See *Weed Abstr.*, 9, No. 667.

3652. COSMO, I., AND PIERI, G.

Diserbo chimico dei vigneti. (Chemical weed control in vineyards.)

Riv. Vitic. Enol., 1960, 13: 53-66, bibl. 14, illus.

Weedazol (based on ATA), applied first at 6 kg./ha. and later at 7.5 kg./ha., kept the soil clear of most weeds for 2-3 months and severely checked the more resistant types such as grasses and *Plantago major*. Karmex W (a monuron product) at 6 kg./ha. gave poor control of all the weeds present. Telvar DW (based on diuron) was active against all the weeds when applied at 7.5 kg./ha. The vines were damaged severely by ATA, but the other 2 herbicides affected only the leaves.

3653. GAST, A.

Neuere Erfahrungen mit Simazin im Rebbau. (Recent observations on the use of simazine in vines.)

Schweiz. Z. Obst- u. Weinb., 1960, 69: 203-10, bibl. 8.

The treatment of vines with simazine, repeated for several years, did not cause any injury to the crop under normal conditions if applied at normal dosages. Microbiological decomposition, adsorption and the decomposition of simazine by the weed flora prevented the accumulation of the herbicide in the soil. In addition, healthy vines were found capable both of decomposing simazine and of offering resistance to it. Repeated applications did not affect the yield or quality of the grapes.—*Forschungslab. J.R. Geigy AG, Basle.*

Weed control in ornamentals and turf.

(See also 3633, 4224.)

3654. MASTALERZ, J. W.

Weed control under greenhouse benches.

Pa Flower Grs' Bull., 1959, No. 103, reprinted in *Ill. St. Flor. Ass. Bull.*, 1959, No. 198, p. 5, and *Flor. Exch.*, 1960, 134(2): 11.

CMU (Karmex W), at 1 oz./200 sq. ft. in sufficient water to give good coverage, is safe and long lasting for greenhouse use. It acts through the roots, so it should not be applied in houses with ground beds unless these have water-tight bottoms. Sodium arsenite and Stoddard solvent may also be used, but the former is corrosive and the latter is non-persistent. 2,4-D should never be used in greenhouses.

3655. BRITT, K.

Pre-emergence weed control in container grown nursery stock.

Proc. 11th Calif. Weed Conf., 1959, pp. 84-7.

Neburon at 4, 8 and 16 lb./ac. and/or simazine at 2, 4 and 8 lb./ac. were applied separately, before weed emergence, to 1 gal. cans planted with 65 ornamental species. Neither of the herbicides inhibited weed seed germination, but both were toxic to young seedlings and suppressed weeds for 3 to 5 months. The highest rate of each compound was often injurious, and some of the ornamentals were damaged even by the lower rates.—*Univ. Calif.*, Davis.—*From Weed Abstr.*, 9, No. 51.

3656. BYLTERUD, A., AND RUSTEN, A.

Forsøk med kemiske midler mot ugras i planteskolene. (Chemical weed control trials in nurseries.)

Gartneryrket, 1959, 49(10): 162-8, illus.

See *Weed Abstr.*, 9, No. 50.

3657. SCHAMM, R. J., JR., AND KLINGMAN, G. C.

Weed control in ornamentals.

Res. and Fmg N.C., 1959, 18(1): 15.

Dry-cleaning fluid and fuel oil, to which a trace of CIPC or PCP may be added, can be used at 15-30 gal. per acre to clear land and paths where ornamentals are not directly growing. For use among the plants simazine was the best herbicide tested.

3658. RIES, S. K., GRIGSBY, B. H., AND DAVIDSON, H.

Evaluation of herbicides for several species of ornamentals.

Weeds, N. York, 1959, 7: 409-17, bibl. 11, illus.

When applied in June, 2-3 days after transplanting 2-year-old *Cotoneaster acutifolia*, *Syringa chinensis*, *Taxus cuspidata* and *Taxus media* "Hicksi", commercially acceptable weed control without crop injury was given by 2,4-DES at 4 lb./ac. $\pm$ NPA at 4 lb./ac. and by simazine at 2 and 4 lb./ac.; acceptable weed control but crop injury was given by monuron 1 lb./ac., diuron 1 lb./ac. $\pm$ 2,4-DES 4 lb./ac. or $\pm$ dalapon 5 lb./ac. and by amitrol 6 lb./ac. No further injury was caused and good weed control was obtained when the above plots were sprayed with simazine at 4 lb./ac. the following June. Results are given of soil fumigation treatments compared with simazine sprays, and of a greenhouse test on some herbicides including simazine. In a growers' trial, where simazine was compared with neburon and 2,4-D, simazine gave much the best results. Based on this survey, 30 species are classed as resistant and 7 as sensitive to simazine. From observations made in the greenhouse test it is suggested that dalapon and simazine may be synergistic. [See also *H.A.*, 30: 552.]—Mich. St. Univ., E. Lansing.—From *Weed Abstr.*, 9, No. 48.

3659. FABER, H.

Unkrautbekämpfung in Ziergehölzquartieren und Baumschulsaatbeeten. (Weed control in plots of woody ornamentals and in nursery seed-beds.)

Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 144-8.

Among non-injurious chemicals tested neburon gave the best weed control, followed by simazine and a urea derivative plus carbamic acid ester A. The herbicides should be applied within the rows after planting in the nursery. This will result in freedom from weeds for the first 3 months, after which time no further treatment is required as the plants are then capable of suppressing the weeds themselves. Neburon and the urea derivative + carbamic acid ester A proved satisfactory for weed control in nursery seed-beds, but simazine and CIPC were unsuitable. The chemicals should be applied within 5 days of sowing while the soil is moist.—PflSchAmt Landes Schleswig-Holstein.

3660. TAYLOR, L. F.

New developments in roadside weed control.

Agric. Newsl., 1959-60, 27(4): 8.

Where the roots of valuable trees or ornamentals extend into treated roadside areas Karmex DL (diuron) is less likely to cause injury than Telvar W (monuron) at equal dosages, and the hazard can be further reduced by using Karmex at a low

rate in combination with aromatic oils or other herbicides.

3661. NYHLÉN, Å.

Kemisk ogräsbekämpning till blomsterväxter. (Chemical weed control in flowers.)

Årsb. S.H.T.F.s, 1958, pp. 7, illus.

Results are given of 1 year's pre-planting and post-emergence experiments in the greenhouse and field, in which a number of ornamentals were treated with: (1) Alanap 1 (90% NPA) 4 kg./ha., (2) allyl alcohol 100 l./ha., (3) monuron ca. 3 kg./ha., (4) Premin (30% dinoseb?) 8 l./ha., (5) Rensa (20% 2,4-DES) 6 kg./ha., (6) simazine 2 kg./ha., (7) amitrol 5 kg./ha., (8) SMDC 100 l./ha., and (9) Weedkiller (an oil) 600 l./ha. In the pre-planting tests promising results were given on: freesias by 3 and 7, anemones by 2, 7, 4, 5, 8 and 9, gladioli by all compounds, chrysanthemums by 2, 4, 5, 8 and 9, stocks by 2, 4, 5, 8 and 9, carnations by 1, 2, 4, 5, 8 and 9, and *Viola cornuta* by 1, 4, 5 and 8. Only monuron appeared to be injurious to delphiniums. In the post-emergence trials promising results were given in anemones by 8, stocks by none, chrysanthemums by 5, carnations by 4, 5, 6, 7 and 8, gladioli by 1, 5 and 8, and *Viola cornuta* by 1, 5, 8 and 9. Monuron 0.4 kg./ha., Premin 4 l./ha., Rensa 2 kg./ha. and simazine 1 kg./ha. were applied to roses post-emergence without causing injury, and monuron 0.8 kg./ha., Premin 12 l./ha. and simazine 1 kg./ha. were applied to freesias post-emergence without injury.—Statens Trädgårdsförsök, Nyckelby, Sweden.—*Weed Abstr.*, 9, No. 47.

3662. WOOD, J.

Control of grasses in bulb growing.

Proc. Dalapon Symposium, London, 1959, p. 25.

TCA at 4 lb./ac. applied to narcissi and tulips pre-emergence for *Poa annua* control at first appeared promising, but flowers produced in the second season after spraying were severely injured. Similar results were obtained with dalapon at 8 and 12 lb./ac., but the 4 lb./ac. rate appeared to be more promising, although some damage to the bulb foliage was observed. Irises appeared to be more resistant to dalapon than narcissi or tulips. Injury seemed more likely to occur when the spray was applied to bare soil than when the soil was covered with grass.—Kirton Exp. Husb. Fm, Lincs.—*Weed Abstr.*, 9, No. 657.

3663. WHITE, R. W., JR.

Weed control in lawns and ornamentals.

Proc. Soil Crop Sci. Soc. Fla., 1958, 18: 216-18.

Efficient fertilization, mowing and watering are considered the best means of weed control in lawns, but the occasional use of 2,4-D, 2,4,5-T and DSMA may be necessary in certain circumstances.

For ornamentals soil fumigants are recommended for pre-planting treatment, Sesone or simazine for pre-emergence, and PCP for post-emergence treatments.—Univ. Fla.

3664. WATSON, A. J., AND LEASURE, J. K.

Zytron, a promising material for crabgrass control.

Down to Earth, 1959, 15(3): 2-5, illus.

Zytron (0-(2,4-dichlorophenyl) 0-methyl isopropylphosphoramidothioate) can act as a selective root toxicant, a selective contact herbicide or a systemic seed killer. When applied pre-emergence at 4 to 8 oz. per 1,000 sq. ft. of turf it has given very good control of crabgrasses (*Digitaria ischaemum* and *D. sanguinalis*), a few other annual grasses and certain broad-leaved weeds. Crabgrass tolerance to Zytron increased rapidly after germination, but applications at high rates in the autumn during seed ripening prevented emergence the following year. Merion and Kentucky bluegrasses were found to be especially tolerant of the herbicide, but other lawn grasses might be temporarily injured. With the exception of irises and dichondra, established ornamentals showed resistance.

3665. ANON.

The control of seaside chickweed.

Sports Turf Bull., 1959, No. 47, pp. 6-7.

Good control of seaside chickweed (*Cerastium semidecandrum*) seedlings in turf may be obtained with calcined sulphate of iron at 150 lb./ac., preferably in the autumn. The application should be made on a settled day when there is dew or moisture on the grass. When treatment is made in March, if rain does not fall within 4 days after treatment, the greens should be artificially watered to prevent excessive scorch to the grass. It is advisable to use sulphate of iron with discrimination on greens where the soil is known to be rather acid, as it tends to cause even greater acidity.—*Weed Abstr.*, 9, No. 40.

Weed control in tropical and sub-tropical crops.

(See also 3639, 3641, 4423, 4477, 4492, 4499, 4516, 4555, 4557, 4624.)

3666. TAS, R. N.

Essais de lutte contre *Paspalum conjugatum* Berg. dans les chemins de plantation. (Trials on the control of *P. conjugatum* in plantation pathways.) [English summary.] *Proc. Afr. Weed Control Conf.*, 1958, 1960, pp. 164-78.

Control by hand weeding is very costly, but if done every 6 weeks *P. conjugatum* can be eradicated, provided there is no reinfestation. In preliminary trials with herbicides the best and most economical results were obtained with sodium arsenite at 6.8-34 kg./ha. In a further trial with sodium arsenite the most effective treatments in descending

order were: (1) 10.2 kg./ha. applied monthly, (2) 6.8 kg./ha. monthly, and (3) 13.6 kg./ha. every 6 weeks; the most economical treatments were (2), (3) and 68 kg./ha. twice a year, but it is thought that a relatively heavy initial rate of 50-100 kg./ha., followed by low rates of 10-15 kg./ha., would give better results. Once established, *Pueraria javanica* competes successfully with *P. conjugatum*. Dalapon at 27.2 or TCA at 62.8 kg./ha., applied at time of sowing *P. javanica*, were effective in controlling grasses and securing establishment. It is advised that sodium arsenite should not be applied near coffee trees; residues of 0.8-1.2 p.p.m. have been found in ripe fruits of trees on the edge of sprayed plots. Plant successions after spraying with sodium arsenite are briefly discussed.—I.N.É.A.C. Yangambi.—From *Weed Abstr.*, 9, No. 566.

3667. HARKNESS, R. W., AND RUEHLE, G. D.

Mulching tests on young avocado trees planted in old grove land.

A.R. Fla agric. Exp. Stats, 1957-58, p. 352.

Black and other opaque plastics were compared with grass mulch, hand hoeing, pre-planting Vapam soil treatment and contact herbicides for weed control in avocados planted in an old lime grove. Black plastic controlled all but a few weeds and the trees mulched with this material grew very well. White plastic showed no advantage over black and aluminized plastic lacked durability. Vapam treatment was effective for only 2-3 months. Frost damage was more severe on trees mulched with grass than on those mulched with plastic or not mulched. The amount of hand labour saved by mulching is to be determined.

3668. ANON.

A note on weed control in bananas.

Pest. Abstr. News Summ., Sect. C, 1959, 5: 153-4, bibl. 8.

A brief review of literature [all of which has been mentioned in *Horticultural Abstracts*].

3669. CHAMPION, J., AND MONNET, J.

Essais d'herbicides en bananeraie. (**Weed control in banana plantations.**) [English summary 7 lines.]

Fruits d'Outre Mer, 1959, 14: 459-64, bibl. 3.

In herbicide trials in French Guinea over 2 years, 5 kg. of monuron per ha. gave fair control of weeds, its persistence depending on the rainfall in the month following application.—I.F.A.C., Foulaya.

3670. BURT, E. O.

Control of weeds in citrus groves.

A.R. Fla agric. Exp. Stats, 1957-58, p. 60.

Dalapon at 2 to 5 lb./acre, applied 2 or 3 times, and diuron at 8 to 12 lb./acre gave very good weed control with little or no injury to mature, healthy

citrus trees. Young or weak trees were less tolerant of the herbicides, injury being more severe under conditions of high rainfall and/or coarse textured soils. These herbicides are not yet approved for use on citrus in Florida.

3671. DEDECA, D. M.

Plantas invasoras dos cafêzais. (Weeds of coffee plantations.)

Bol. Super. Serv. Cafê, S. Paulo, 1959, **34**(386): 16-20.

As found in Brazil; control not considered.

3672. LEME, H. DE A., SAAD, O., AND MONTEIRO, M. V. DE M.

Comparação entre os cultivos manual, mecanizado, motomecanizado e químico da cana-de-açúcar na região de Piracicaba. (Comparison of manual, mechanized, motorized and chemical weeding of sugar cane in the Piracicaba area.)

Rev. Agric. Piracicaba, 1959, **34**: 173-81, bibl. 4.

Hand weeding took 9 times as long as using a horse-drawn cultivator, 77 times as long as using tractor-drawn implements, and 118 times as long as spraying herbicides with tractor-drawn apparatus. Under local conditions the horse-drawn cultivator was the least costly to operate, but for a slightly higher cost the use of a tractor was fully justified. Chemical spraying was rather more expensive, but the differences in cost between the 3 methods were small compared with the very high cost of hand weeding.

3673. RUINARD, J.

The chemical control of weeds on sugar-cane estates of Java.

Neth. J. agric. Sci., 1960, **8**: 34-8, illus.

The application of herbicides after the planting furrows had been made but immediately before planting did not give satisfactory weed control and had a harmful effect on the cane. The most satisfactory weed control was obtained by a surface application, immediately before furrowing, of a mixture of 20 kg. TCA and 2 kg. of the ammonium salt of 2,4-D per ha. This treatment prevented weed growth for up to 8 weeks and had no adverse effect on cane growth. It is recommended that the cane should be planted as soon as possible after treatment. A machine designed for the large-scale application of herbicides is described.

3674. COX, J. R.

Weed control in sugar cane in the West Indies.
World Crops, 1959, **11**: 434-6, illus.

With the triazine weedkillers, in particular simazine.

3675. ORSENIGO, J. R.

Herbicide control in sugarcane.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 276-7.

Applications of dalapon caused non-significant yield differences in the first year's harvest, but in the second year the treatments caused a non-significant reduction of cane and significant reduction of sugar. Two dalapon applications of 5 lb./acre or 3 applications of 3, 4 and 5 lb./acre gave practical control of the two principal grasses, *Digitaria* sp. and *Eleusine indica*. Effective annual grass control with a minimum of cane injury was obtained with a total of about 10 lb./acre of dalapon applied in 2 or 3 doses at monthly intervals, starting when the cane was 8 in. tall. When herbicides were applied under dry surface-soil conditions prior to the emergence of plant cane, the best treatments were Silvex at 4 lb./acre, Geigy-30031 at 5 lb./acre, Emid at 13.3 lb./acre, and Dow M-1091 at 8 lb./acre. Of treatments applied to 18-in.-tall plant cane, Silvex at 4 lb./acre, Emid at 5.3 and 10.6 lb./acre, monuron at 2 lb./acre and Dow M-1091 at 4 lb./acre gave good control of annual weeds without causing crop injury. No severe injury to first ratoon cane was noted from diuron at 2.3 and 3.9 lb./acre, Eptam 6E at $\frac{1}{2}$, $\frac{3}{4}$ and 1 $\frac{1}{2}$ gal./acre, simazine 50W at 4, 8, 12 and 23 lb./acre and 2,3,6-TBA at 4, 8, 12 and 16 lb./acre.

3676. ORSENIGO, J. R.

The tolerance of sugar cane to pre-emergence and post-emergence applied herbicides in screening experiments on organic soil.

Mimeo Rep. Fla Everglades Exp. Stat. **59-11**, 1959, pp. 3.

See *Weed Abstr.*, 9, No. 513.

Weed control in vegetables.

(See also 3630, 3633, 3805, 3932, 4627, 4629.)

3677. MARVEL, M. E.

Weed control in vegetable crops.

Proc. Soil Crop Sci. Soc. Fla, 1958, **18**: 207-9.

Recommendations for various vegetables and strawberries in Florida.

3678. ORSENIGO, J. R.

Primary evaluation of pre- and post-emergence herbicides in vegetable and field crops, fall 1957.

Primary evaluation of post-emergence applied herbicides in vegetable and field crops, spring 1958.

Mimeo. Reps Fla Everglades Exp. Stat. **59-5**, 1958, pp. 10, and **59-6**, 1958, pp. 14.

Weed control investigations in vegetable crops.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 268-71, illus.

The first paper describes experiments on 36 vegetable and 6 field crops with 32 pre-emergence and 16 post-emergence herbicide treatments, and the second describes experiments on 22 vegetable and

some field crops with 21 treatments. The third paper summarizes some of the results obtained.

3679. SCUDDER, W. T.

Chemical weed control studies.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 194-5.

Many herbicides were tested in a large number of crops. CDEC at 2 lb./acre and over, used according to instructions, caused injury to spinach, turnips and mustard. CDAA at 4 lb./acre pre-emergence was successful in broccoli, cauliflower, kale, collards, garden peas, okra and peppers, and at 4-6 lb./acre immediately after transplanting celery.

3680. ROGERS, I. S.

Using chemicals against weeds in vegetables.

J. Agric. S. Aust., 1959, 63: 31-5.

Salt is effective for weed control in beetroot. In peas DNBP is less injurious but more expensive than MCPA. 2,4-D or MCPA can be used in asparagus and strawberries; in the latter chloro-IPC is useful as a preplanting spray. Kerosene is valuable for weed control in carrots and parsnips, if applied at the 2-4-leaf stage. Kerosene and chloro-IPC can be applied as pre-emergence sprays in onions, while DNOC and potassium cyanate are effective as post-emergence sprays in this crop.

3681. FISCHER, A.

Neue Herbizide zur Unkrautbekämpfung in Rüben- und Gemüse-Kulturen im Voraufbauverfahren. (New herbicides for pre-emergence weed control in beet and vegetable crops.)

Laborbericht Badische Anilin u. Soda Fabrik 563, 1959, pp. 15, illus.

In laboratory tests OMU (N-cyclooctyl-N',N'-dimethylurea) applied immediately after sowing at 0.8 kg./ha. caused no injury to sugar beet, carrots or onions, whereas monuron and simazine were both injurious. The compound has given promising results in peas, beans and spinach. Weeds susceptible to OMU alone and to OMU + BiPC (butinol-N(3-chlorophenyl) carbamate) are listed. —From *Weed Abstr.*, 9, No. 728.

3682. ORTH, H.

Problematik und Aussichten der Unkrautbekämpfung in Spezialkulturen. (The problems and prospects of weed control in special crops.)

Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 125-34, bibl. 40.

With special reference to vegetables.

3683. IMMEL, R.

Unkrautbekämpfung in Spezialkulturen mit einem neuen Herbizid. (Weed control in special crops with a new herbicide.)

Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 134-6.

Applications of neburon preparations as pre-emergence herbicides at the rate of 4 kg./ha. (=0.75 kg. active ingredient) achieved adequate weed control in the vegetables tested, but only in the presence of sufficient soil moisture.—C.H. Boehringer Sohn, Ingelheim am Rhein.

3684. SOUTHWICK, L.

Control of couch in potatoes, sugar beet, turnips, rhubarb and asparagus.

Proc. Dalapon Symposium, London, 1959, pp. 13-14.

The main method of controlling *Agropyron repens* with dalapon is by pre-planting treatments. For crops planted on land infested with couch the following recommendations are made: rhubarb—10 lb./ac. sprayed in the spring and autumn without wetting the foliage; asparagus—7.5 lb./ac. applied to the base of the plants in the dormant season, or after a close cut of spears, or when fern growth is mature in the autumn.—Dow Chem. Co., Midland, Mich.—From *Weed Abstr.*, 9, No. 705.

3685. MEGGITT, W. F., AND OTHERS.

An evaluation of cultivations and monuron in asparagus.

Proc. Amer. Soc. hort. Sci., 1959, 74: 580-2, bibl. 7.

In a 4-year experiment with asparagus on a sandy loam soil there was found to be no advantage (in respect of yields) in giving the normal 4-6 cultivations during the growing season, provided weeds were effectively controlled with monuron. Two applications of monuron at 2 lb. active ingredient per acre, applied before and after the cutting season (on about 20 April and 20 June) provided excellent weed control throughout the growing season.—N.J. agric. Exp. Stat., New Brunswick.

3686. MATTHEWS, L. J.

Weed identification and control: Californian thistle.

N.Z. J. Agric., 1959, 99: 313, illus.

Cirsium arvense can be checked in brassicas by 15 lb. monochloroacetate per acre, and controlled by 2 lb. amitrol per acre applied before crop establishment.

3687. ORSENIGO, J. R.

For direct-seeded cabbage try pre-emergence chemical weed control.

Sunshine St. agric. Res. Rep., 1959, 4(1): 14-15.

CDAA and CDEC at 4, 6 and 8 lb./ac. applied 1 or 2 days after seeding cabbage on organic soil both gave excellent control (and in all cases better than mechanical cultivation) of grasses and broad-leaved weeds (mainly *Portulaca oleracea*), without harming the crop. Recommendations given for grower trials are: (1) use CDAA for "grassy" fields and CDEC where broad-leaved

weeds predominate; (2) 4-6 lb./ac. is usually sufficient; and (3) best results are obtained on freshly prepared soil, as these herbicides will not control emerged weeds.—Everglades Exp. Stat., Fla.—*Weed Abstr.*, 9, No. 506.

3688. CAMPAGNA, E., AND MARCOTTE, M.
Désherbage chimique dans les cultures de choux de Siam. (Chemical weeding of Siamese cabbage crops.)
Rapp. Minist. Agric. Québec 1958-59, 1959, p. 56.

The best results were given by pre-emergence treatment with TCA, dalapon or potassium cyanate, each at 32 lb./acre, or by pre-sowing treatment with dalapon at the same rate. Post-emergence treatments proved unsatisfactory, and there was some crop injury from the pre-emergence applications of TCA and dalapon.

3689. SHADBOLT, C. A.
Weed control in celery.

Proc. 11th Calif. Weed Conf., 1959, pp. 33-4.
Monuron and diuron severely injured celery, particularly in high rainfall areas. Simazine gave varied results on celery at different locations (which did not appear to be due to moisture or rainfall variability); chlorosis and stunting resulted in yield reduction even at 0.5 lb./ac. Neburon at up to 2 lb./ac. caused no injury or yield reduction and gave 80-100% weed control; at 3-6 lb./ac. it may cause stunting, particularly early in the season, but no reduction in stand has been observed. Chlorpropham at 4-6 lb./ac. + Stoddard solvent at 20 gal. in 80 gal. of water gave 80% weed control, and chlorpropham at 4-6 lb./ac. alone gave 60% weed control, whereas Stoddard solvent at 20 gal./ac. alone gave only 30%. Heart injury to celery was observed in one instance when Stoddard solvent was applied in hot weather.—Univ. Calif.—*Weed Abstr.*, 9, No. 30.

3690. ELLIOTT, J. G.
The use of simazine for weed control in field beans.
Mimeo. Rep. Dep. Agric., Univ. Oxford D.95, 1959, pp. 5.

In this summarized report from 20 sources the responses of lima, dwarf, stick and runner beans and of weed species to pre-emergence applications of simazine are described.—From *Weed Abstr.*, 9, No. 255.

3691. WELDON, L. W., AND TIMMONS, F. L.
Chemical control of annual weeds in dry field beans.
Mimeo. Circ. Wyo. agric. Exp. Stats 115, 1959, pp. 9.

Results are given of trials with more than 40 selective weedkillers carried out from 1955 to 1958. Their activity depended greatly on soil type.

Mechanical incorporation into the surface soil improved the effectiveness of EPTC and CDEC, but not that of DNBP, neburon and diuron. The lowest effective rates for EPTC and CDEC, applied pre-emergence to beans and incorporated into the surface soil, were 4-5 lb./acre and 6 lb./acre, respectively. Effective weed control under certain conditions was also obtained using DNBP, 6 lb./acre and neburon 6 lb./acre.

3692. PURNELL, D. C.
Chemical weed control in onions.

Proc. 11th Calif. Weed Conf., 1959, pp. 35-7.
In tests conducted in 1957 on direct seeded and transplanted onions potassium cyanate at 18 lb./ac. in 50 gal. gave very good weed control without causing crop injury. In 1958 several compounds were applied, before the appearance of weeds, to Flat Italian Red onions over a 1 ft. band in 300 gal./ac. Significant yield increases over those of the controls were obtained with CDAA, CDEC, CIPC and neburon. Results of weed suppression by the herbicides are given.—Univ. Calif., Davis.—From *Weed Abstr.*, 9, No. 33.

3693. VAN OORSCHOT, J. L. P.
Enkele effecten van chloor-IPC op kiemplanten van uien. (Some effects of chlorpropham on onion seedlings.) [English summary.]
Jb. Inst. biol. scheik. Onderz., Wageningen, 1959, pp. 55-64, bibl. 4.

Chlorpropham at 1-2 p.p.m. applied before, or just after, onion emergence was found to cause stunting and a marked decrease in root and shoot weight. The compound caused chlorosis of seedlings grown in the dark, but not of those grown in the light. Granular and emulsifiable chlorpropham had the same effect.—*Weed Abstr.*, 9, No. 252.

3694. ARNDT, F.
Untersuchungen über die Eignung verschiedener Herbizide im Vor-Auflaufverfahren zur Unkrautbekämpfung in Rüben, Zwiebeln und Karotten. (Trials of the usefulness of different herbicides for pre-emergence weed control in sugar beet, onions and carrots.) [English and French summaries 1 p. each.]
Gartenbauwiss., 1959, 24: 108-41, bibl. 84, illus.

After a review of previous work on the subject, the author describes experiments carried out at the Agricultural College at Stuttgart-Hohenheim and summarizes the results obtained with the various materials. The activity of SES was apparently largely dependent on weather conditions. Young crop plants were sensitive to it. CMU proved less toxic to weeds and crops during long periods of dry weather. It acted best on soil with a low organic content. Onions were sensitive to it,

whereas sugar beets and carrots showed some degree of tolerance. PCP as an emulsifiable liquid showed good contact weed control. Its effect depended on time of weed germination. It was applicable on all three crops, but if heavy rain followed soon after treatment the crop seedlings suffered badly. The activity of CIPC was dependent on soil type and weather. Although, as in the case of CMU, the effectiveness of CIPC was lower on soils with a high organic content, it still remained highly toxic to many weeds without injuring the crop. CIPC could safely be applied to onions on soils of medium to high organic matter content. On soils of low organic matter content damage occurred, especially in hot, wet weather. Carrots were more tolerant, but sugar beets were sensitive. In this connection shallow sowing of carrots and onions proved undesirable. In the presence of weeds not controlled by CIPC, a mixture of CIPC with 2 kg./ha. DNC gave better pre-emergence weed control than CIPC alone. Mixtures of most of the other compounds caused crop damage.

3695. ANON.

De gevaren van chemische onkruidbestrijding in de nabijheid van peen. (**The dangers of chemical weed control in the neighbourhood of carrots.**)

Weekbl. Bloembollcult., 1959, 70: 381, illus.

Symptoms of MCPA injury described.

3696. GAGNON, L. P.

Désherbage chimique dans les cultures de betteraves de table et de carottes. (**Chemical control of weeds in table-beet and carrot crops.**) *Rapp. Minist. Agric. Québec 1958-59*, 1959, pp. 57-8.

In beet crops pre-emergence spraying with TCA at 10 lb./60 gal./acre was excellent against annual grasses, though less effective in controlling *Chenopodium* spp., *Persicaria* spp. and bindweed, but EPTC at 8 lb./60 gal./acre gave better results, without any injury to the crop. In carrot crops CIPC at 4 lb./60 gal./acre, applied before emergence, gave excellent control of annual weeds. Results with EPTC were poor in the first year, and satisfactory only for the clearance of annual grasses in the second year.

3697. MINISTRY OF AGRICULTURE, LONDON.

Chemical weed control in carrots, parsnips and parsley.

Adv. Leaflet. Minist. Agric. Lond. 478, 1959, pp. 4.

By pre- or post-emergence spraying.

3698. ASHTON, F. M.

Weed control in lettuce and cole crops.

Proc. 11th Calif. Weed Conf., 1959, pp. 32-3.

CDEC or propham at 4-6 lb./ac. applied pre-emergence immediately after planting and before the first irrigation are recommended for weed control in lettuce. CDEC appears to cause a slight reduction in stand and temporary stunting. Owing to the volatility of the two herbicides excessive soil surface temperatures may result in reduced weed control.—Univ. Calif., Davis.—From *Weed Abstr.*, 9, No. 25.

3699. WILSON, H. R.

Weed control in spinach.

Proc. 11th Calif. Weed Conf., 1959, pp. 28-9.

Monuron at 0.5-1 lb./ac., applied pre-emergence immediately after planting, will give excellent control of most broad-leaved weeds, but at higher rates it may severely damage spinach or succeeding crops. NTCA (TCA (sodium)), applied pre-emergence at 10 lb./ac., can be used to control grasses. Of other chemicals used, propham and neburon have given good control of broad-leaved weeds, and dalapon of grasses.—From *Weed Abstr.*, 9, No. 27.

3700. VERLAAT, J. G.

Onkruidbestrijding in spinazie. (**Control of weeds in spinach.**)

Groenten en Fruit, 1959, 14(46): 1393-4.

Sulphuric acid and oils $\pm$ PCP do not usually injure spinach when used as pre-emergence sprays; however, oils alone are too expensive and oils + PCP can cause injury if rain follows shortly after spraying, and must be applied 3 or 4 days before emergence instead of only 2 as with sulphuric acid. Sulphuric acid has increased yields more than can be accounted for by the removal of weed competition—it is suggested this may be due to its rendering calcium more readily available. CIPC pre-emergence has caused considerable damage.—Proefst. Groenteteelt, Alkmaar.—*Weed Abstr.*, 9, No. 248.

Weed control in hemp.

(See also 4398.)

3701. FERENCZY, L.

New data on superselective weed control. I. The regulatory effects of 2,4-dichlorophenoxy-ethylamine.

Naturwissenschaften, 1959, 46: 237, bibl. 3, illus.

In laboratory experiments the activity of 2,4-DEA was similar to that of 2,4-D, but it did not injure hemp. If these results are confirmed in field experiments, the problem of chemical weed control in hemp has been solved.—Inst. Plant Physiol., Univ. Szeged, Hungary.

VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE

General.

(See also 3160, 3222, 3223, 3225, 3227, 3526, 3626, 4145, 4377, 4597, 4604-4609, 4613-4615, 4619, 4622, 4623, 4629-4631.)

3702. MAURITIUS DEPARTMENT OF AGRICULTURE.
Guide de culture potagère. (**Guide to vegetable growing.**)

Bull. Mauritius Dep. Agric. **92**, 1959, pp. 37, Re. 1.

Advice on the planting, cultivation and maladies of vegetables and garden fruits under tropical conditions.

3703. NILSSON, F.

Fältmässig köksväxtodling. (**Vegetable growing in the field.**) [English summary 17 lines.] *J. roy. Swedish Acad. Agric.*, 1959, **98**: 487-96.

A general survey of the Swedish vegetable industry.

3704. NORTH, C.

Research on vegetables at the Scottish Horticultural Research Institute.

Sci. Hort., 1960, **14**: 104-9, bibl. 8, illus.

Points discussed are: *Brussels sprouts*: Variety trials, breeding to produce large-sprouted varieties suitable for Scottish conditions. development of F₁ hybrid seed, a comparison of August sowing with spring sowing. *Cabbages*: Variety trials, breeding varieties for winter maturing and storage. *Dwarf beans*: Breeding varieties for processing, and inter-specific hybridization with runner beans.

3705. TURNER, E. A.

Make the best of your dutch lights.

Grower, 1960, **53**(14), Suppl. pp. 8-9.

An outline of the work carried out at Efford Experimental Station, Hampshire, since 1954, with particular reference to the use of dutch lights on lettuce, marrows, celery, melons and strawberries.

3706. BANADYGA, A. A., AND WELLS, J. C.

Vegetable plant production.

Ext. Circ. N.C. agric. Ext. Serv. **231**, revised 1959, pp. 18, illus.

Advice on all aspects of seedling production, including greenhouse and frame management.

3707. CRÜGER, G., AND ORTH, H.

Auflaufförderung von Gemüsesamen durch Saatgutbehandlung im Vorrats- und Überschussbeizverfahren. (**The stimulation of germination in vegetables by seed treatment.**)

Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 224-30, bibl. 1.

The beneficial effects of seed treatment for vegetables are discussed. Treating dwarf bean seeds with TMTD and captan preparations (3 g. of the 80% and 83% chemicals, respectively, + 15 c.c. water per kg. seed) resulted in the following

germination 14 days after sowing: Untreated, 12%; TMTD, 77%; captan, 82%. Seed treatment with TMTD, COBH (Cerenox) and captan gave good results with peas, spinach, cucumbers, onions, lettuce, carrots, cabbages and tomatoes. Experiments with beans, peas and onions showed that seed treatment well in advance of sowing with a mixture of insecticides (dieltrin + aldrin) and fungicides (captan) is not detrimental to germination.

3708. CARMESIN, H.

Untersuchungen über die Empfindlichkeit von Gemüsesaatgut gegenüber Beizmitteln. (**Studies on the susceptibility of vegetable seeds to chemicals used in seed treatment.**) *Mitt. biol. Bundesanst. Berlin-Dahlem*, 1959, No. 97, pp. 230-9, illus.

Experiments with various chemicals and vegetables, the data of which are tabulated and presented graphically, resulted in the following conclusions: Mercury preparations and Cerenox caused injuries more frequently than Tritisan, Elbe and Atiram, especially if applied at relatively high rates. Since different vegetables possess a specific susceptibility, it is advisable first to ascertain the safe range of the disinfectant. Preparations with a high phytotoxic vapour pressure, such as Abavit, are liable to cause more severe injury when applied to seed before storage than when applied immediately before sowing.—Inst. f. Gemüseb., tech. Hochsch., Hannover.

3709. KRAUJA, A. JA.

The effect of micro-elements on the germination viability of seeds and some biochemical processes in plants. [Russian, with English summary 1½ pp.]

Tr. Akad. Nauk LatvSSR (Mikroelem. v. Rasteniev.), 1958, **9**: 195-216, bibl. 25, illus.

The percentage germination of pea, cabbage and tomato seeds was increased by seed treatment with 0.01-0.03% boric acid. Higher concentrations had an inhibiting effect on germination. ZnSO₄ at 0.05-0.1% and MnSO₄ at 0.1-0.4% were also effective in increasing germination. B increased somewhat the polyphenoloxidase and peroxidase activity in peas; Zn and Mn increased the ascorbin-oxidase activity in peas in the early growth stages and the polyphenoloxidase activity later. Trace elements increased the water content of the seeds and this led to a higher dry matter content in the leaves.

3710. BAMBER, K. K.

Combined applications of micro-elements and fungicides to seeds. [Russian, with English summary ¾ p.]

Tr. Akad. Nauk LatvSSR (Mikroelem. v. Rasteniev.), 1958, **9**: 289-97, bibl. 4.

Dusting vegetable seeds with borates and with

mixtures of boron and copper sulphate (2-6 g. per kg. of seed), combined with Granosan, thiram, and other fungicides, increased the yields of carrots, turnips and other root crops. The seeds of flax and tomatoes remained viable when treated with 8-10 g. of borates per kg. of seeds, whereas bean and pea seeds were sensitive to as little as 1.5-2 g./kg. Combining seed dressings and plant spraying with micro-elements increased both germination and yield.

3711. JUNGES, W.

Abhängigkeit des Schossens biennier Gemüsepflanzen von ihrem Alter und von der Dauer der Einwirkung niederer Temperaturen. (**The effect of age and of the duration of low temperature treatment on seed stalk development in biennial vegetable plants.**) [Russian and English summaries $\frac{3}{4}$ p. each.] *Arch. Gartenb.*, 1959, 7: 485-504, bibl. 25.

The experimental plants were two varieties of kohlrabi and one variety each of beetroot, celeriac and carrot. The treatment of the plants began in December and consisted of 0, 2, 4, 6 and 8 weeks' cultivation at higher temperatures (not specified) followed by vernalization for 0, 4, 6 and 8 weeks. During vernalization the mean temperature for a 5-day period was below 10° C. and the minimum temperature between 1° and 5° C. During the further cultivation of the whole series the mean temperature was raised from 10° C. to 20° C. within two months. With all plants the percentage of seed stalk formation increased with the duration of the growth period preceding vernalization. The optimum period of vernalization, following cultivation for 0-8 weeks, was 6 weeks for carrots, celeriac and one kohlrabi variety, 8½ weeks for the other kohlrabi variety and 9-10 weeks for beetroot. Longer treatment with low temperatures led to a reduction in the percentage of seed stalk formation. It is concluded that the biennial plants examined go through a definite phase during which their development benefits from the application of low temperatures. This phase does not occur automatically at a specific age but needs low temperatures to initiate it. In these crops seed production during the first year should be enhanced by an extended period of cultivation prior to vernalization, coupled with as short a period of cold treatment as possible.—*Inst. Gartenb. Dresden-Pillnitz.*

3712. RUF, R. H., JR.

Studies on the application of soluble fertilizers through an irrigation system: 1. The effect of various nutrient sources and methods of fertilizer application on selected vegetable crops. II. The movement of soluble salts in porous media.

Diss. Abstr., 1959, 20: 1503, being *L.C. Card No. Mic.* 59-5301 of 76 pp.

In 1957 the responses of 9 vegetable crops to 12 different sources and methods of application of fertilizer were compared, and in 1958 8 treatments and 4 crops (tomatoes, potatoes, cabbages and snap beans) were used. Liquid 8-8-8 fertilizer placed in bands at planting gave consistently, but not significantly, higher yields in both years than granulated 12-12-12 applied in the same manner. A split application of N or of a complete fertilizer did not alter the yield when compared with treatments in which all the fertilizers were applied at planting. A fertilizer containing free ammonia applied through a sprinkler irrigation system caused severe foliar injury and a subsequent decrease in yield. Part II examines the movement of sodium nitrate in soil and other media.—*Cornell Univ.*

3713. PFAFF, C.

Einfluss der Beregnung auf die Nährstoffauswaschung bei mehrjährigem Gemüseanbau. (**The effect of sprinkler irrigation on nutrient leaching where vegetable crops are grown for several years.**)

Z. Pflernähr. Düng., 1958, 80: 93-108, bibl. 6.

In 8 years' lysimeter trials with many vegetables grown in a sandy soil marked yield increases were obtained both by mineral N manuring and by sprinkler irrigation, especially if the two measures were combined and preceded by basic P and K applications and by a supply of stable manure. In the presence of a complete fertilizer each 1 mm. of irrigation water applied resulted in average yield increases of 150 kg. of fresh vegetables per hectare compared with 70 kg./ha. in the series without mineral N fertilizers. An adequate supply of N was thus indispensable for the full utilization of the irrigation water. Irrigation led to an increase in water loss, about 35 mm. remaining unutilized out of an average of 140 mm. applied. But the irrigated plants took up more N and improved its utilization, thus reducing the amount of N leached from irrigated plots. The increases in plant weight and consequently in water consumption due to N manuring resulted in a reduction of the water loss. However, some N leaching occurred in both non-irrigated and irrigated plots. The results also indicated that in view of the considerable K absorption by vegetables combined with some K leaching from light soils a sufficient K supply is essential, at least in the proportion of 1 N : 1.5-1.7 K₂O. If the residues of the plants are left in the soil at harvesting, about 15 kg. P₂O₅ and 75 kg. K₂O are thereby supplied per hectare. The chloride from the 40% potassium salt was leached out completely, except with vegetables which accumulate chloride. The relatively hard irrigation water used supplied moderate amounts of Ca and Mg to the soil. On the whole, the experi-

mental results point to the necessity of increasing the supply of the chief nutrients by approximately 20% if sprinkler irrigation is practised. Tabulated data are presented for individual vegetables. —Landw. Versuchsstat. Limburgerhof, Bad. Anilin-u. Soda-Fabrik A.G., Ludwigshafen a. Rhein.

3714. IRITANI, W. M., AND ARNOLD, C. Y.
Nitrogen release of vegetable crop residues during incubation as related to their chemical composition.
Soil Sci., 1960, **89**: 74-82, bibl. 17.
 See *H.A.*, 29: 3566.

3715. WESTGATE, P. J., FORBES, R. B., AND BLUE, W. G.
Soil phosphorus reserves in old vegetable fields in the Sanford area.
Proc. Soil Crop Sci. Soc. Fla., 1958, **18**: 111-15, bibl. 11.

In a survey of vegetable farms a positive correlation was found between the number of years of cropping and the total P in the top 6 in. of soil, figures of 10,000 lb. per acre P_2O_5 being obtained where the period was about 50 years. On such soils celery, sweet corn and cabbage failed to respond to additional P fertilizer in 4 successive years. [From authors' summary.]

3716. N.S.W. DEPARTMENT OF AGRICULTURE, BIOLOGICAL BRANCH.
Sclerotium stem rot caused by *Sclerotium rolfsii*.
Agric. Gaz. N.S.W., 1959, **70**: 598-9, illus.
 Control measures for vegetables and ornamentals enumerated.

3717. REED, L. B., AND DOOLITTLE, S. P.
Insects and diseases of vegetables in the home garden.
Home Gdn Bull. U.S. Dep. Agric. **46**, revised 1959, pp. 48, illus.
 Symptoms and control arranged under crop headings.

3718. DARBY, J. F., AND WILSON, J. W.
Synthetic insecticides and fungicides for vegetable crops in central Florida.
A.R. agric. Exp. Stats, 1957-58, pp. 189-90.

Late blight of celery: [See *H.A.*, 29: 2451]. *Downy mildew and Sclerotium rot of cantaloupe*: Nabam plus ferric sulphate (2 qts + 1 lb. in 100 gal.) reduced both *Pseudoperonospora cubensis* and *Pellicularia rolfsii* significantly. *Sclerotiniosis of celery*: Terraclor, Terraclor plus ferbam (1 : 1), and hydrated lime, each at 40 lb./acre, applied in 2 treatments to celery with an established infec-

tion of pink rot reduced the number of stalks showing the disease. *Soil residues of hydrocarbon insecticides*: In permanent plots treated with high rates of DDT, lindane, toxaphene, chlordane, aldrin and dieldrin yields of autumn planted squash and of spring planted beans were significantly lower in the DDT-treated plots than in the other plots.

3719. TILEMANS, E. M.
Pesticides attractifs. (Poison baits.)
Bull. hort. Liège, 1960, **15**: 102-8.

Methods of preparing baits for slugs, rodents, moles, ants, cockroaches, cabbage flies, crickets, wireworms and other insects.

3720. TJOA TIEN MO.
 Hasil pertjobaan dengan insektisida² yang mengandung persenjawaan fosfor terhadap *Plutella maculipennis* (Curt.) di lembang (Bandung) yang resisten terhadap DDT, HCH, DSB. (Result of tests of phosphorus insecticides against chlorinated-insecticide-resistant *Plutella maculipennis* in Lembang (West Java). [English summary 2 pp.] ~ *Pemb. Balai Besar Penj. Pert.* **155**, 1959, pp. 11, bibl. 2.

Over the past 14 years the diamond-back moth has built up resistance to DDT, BHC, toxaphene, aldrin, dieldrin and endrin. Of the organophosphorus insecticides tried on vegetables Folidol E-605 46.7% at 0.015% gave the best control, although malathion 55% at 0.04%, Dipterex E-50 50% at 0.05% and Chlorthion 50% at 0.1% were also satisfactory. To obtain similar results endrin 19.2% had to be used at 0.4% concentrations and toxaphene 50% at 0.5%.

3721. GETZIN, L. W., AND CHAPMAN, R. K.
The fate of phorate in soils.
J. econ. Ent., 1960, **53**: 47-51, bibl. 9.

Phorate (Thimet) applied as a soil treatment in the field was more available to cabbage and potatoes grown in a sandy soil than in a clay-loam soil, as indicated by insect-control data and anticholinesterase assay. A measurement of P^{32} -labelled phorate uptake by peas from three soils and quartz sand showed that the largest amounts of toxicant were taken from the quartz sand, followed by lesser amounts from a sandy soil, clay loam and muck, in that order. [From author's abstract.]—Univ. Wis., Madison.

3722. WAITES, R. E., AND OTHERS.
Pesticide residues on vegetables.
A.R. Fla agric. Exp. Stats, 1957-58, pp. 98, 108-9, 191 and 315.
 Results of several residue studies. [See also *H.A.*, 29: 403 and 30: 2129.]

3723. WEINMANN, W.

Quantitativer biologischer Nachweis von Insektizidrückständen in Pflanzenmaterial mit höheren Gehalten an Lauch- und Senfölen. (The quantitative biological determination of insecticidal residues in plant material with relatively high contents of *Allium* and mustard oils.)

Naturwissenschaften, 1958, 45: 170.

With special reference to onions, black radishes and radishes, using *Drosophila melanogaster* as the test insect.

3724. ANDERSON, L. D., AND GUNTHER, F. A.

Nicotine residues in field-treated cauliflower, celery, green beans, kale, mustard greens and spinach.

J. econ. Ent., 1960, 53: 64-5, bibl. 1.

In these tests normal dosages of Black Leaf 40 left no appreciable residues on green beans, celery or cauliflower curds. A slight residue occurred in cauliflower greens but it disappeared within a day or two after treatment. Kale and spinach retained moderate nicotine residues for about a week, and Texas mustard greens retained sizeable residues for nearly 2 weeks. [Authors' abstract. See also *H.A.*, 29: 3592.]—Univ. Calif., Riverside.

3725. HOLMES, E. S., AND HALSEY, L. H.

Mechanical equipment as an aid to the harvesting and handling of cabbage, cucumbers, tomatoes and other vegetables handled in a similar manner.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 40-1 and 170, illus.

The harvesting-aid machine tested in 1956-57 [see *H.A.*, 29: 394] was changed to combine the harvesting and packing operations in a single unit. Cabbage harvesting by the machine was faster and loading less damaging than by hand. Machine loading caused little or no injury to cauliflowers or savoy cabbages. Mechanical harvesting and boxing of mature green tomatoes resulted in slightly less bruising injury than the conventional method of handling, but it caused more skin breaks.

3726. RAMSEY, G. B., FRIEDMAN, B. A., AND SMITH, M. A.

Market diseases of beets, chicory, endive, escarole, globe artichokes, lettuce, rhubarb, spinach and sweetpotatoes.

Agric. Handb. U.S. Dep. Agric. 155, 1959, pp. 42, plus 19 plates, bibl. 134, illus.

Losses due to storage and transport diseases are described and control measures indicated. The illustrations, some in colour, are excellent. Nearly half the handbook is concerned with sweet potatoes.

3727. N.S.W. DEPARTMENT OF AGRICULTURE, BIOLOGICAL BRANCH.

Transport and market diseases of vegetables. *Agric. Gaz. N.S.W.*, 1959, 70: 607-12, illus.

Methods of reducing post-harvest wastage enumerated.

3728. THOMPSON, B. D.

Chemical treatments of fresh vegetables to reduce decay losses during marketing.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 170-1.

Radishes: Black spotting or black pit of packed radishes was effectively controlled by dipping the freshly harvested crop in a solution of oxytetracycline at 50 or 100 p.p.m. or of aureomycin at 100 p.p.m. [see also *H.A.*, 28: 471]. **Strawberries:** Sodium dehydroacetate at 0.75% used as a 30-second dip effectively controlled decay of strawberries caused by *Botrytis cinerea* and *Rhizopus* sp. **Cantaloupes:** Oxytetracycline at 100 or 200 p.p.m. and streptomycin at 200 p.p.m., both combined with 1% sodium orthophenylphenate, were effective in controlling decay of melons caused by various fungi and soft rot bacteria. Some injury was caused by the 1% sodium orthophenylphenate when the dip treatment lasted longer than 5 minutes.

Artichokes.

3729. BURGUEÑO CELA, A.

Nota acerca de la acción bacteriostática de *Cynara scolymus* L. (A note on the bacteriostatic action of *Cynara scolymus*.)

Farmacognosia, 1959, 19: 165-8, bibl. 15, illus.

A yellow oily substance extracted from the leaves and young heads of globe artichokes, which was free from cynarin, inhibited the growth of *Escherichia coli* and *Staphylococcus aureus*.

3730. JONARD, R.

Sur la prolifération *in vitro* de tissus prélevés sur des tubercules de topinambour ayant subi l'action des rayons X. (On the proliferation *in vitro* of tissues taken from Jerusalem artichoke tubers treated with X-rays.)

C.R. Acad. Sci., Paris, 1959, 248: 3603-5, bibl. 3, illus.

A latent change in the cell structure was caused, which revealed itself later when cultured.

Asparagus.

(See also 3685, 4142, 4612.)

3731. HUYSKES, J. A.

De invloed van de diameter van het zaad op de groei van aspergezaailingen. (The influence of seed diameter on the development of asparagus seedlings.) [English summary 11 lines.]

Meded. Dir. Tuinb., 1959, 22: 636-9, bibl. 9, illus.

Experiments in heated glasshouses revealed that from small seeds (diameter under 3 mm.) smaller plants were developed than from medium-sized

and large seeds. As small plants give smaller yields, they are undesirable. Growers are recommended to remove the small seeds by sieving them out. [From author's summary.]—Inst. Vered. Tuinbouwgew., Wageningen.

3732. ANON.

Asparagus spacing trials.

Comm. Gr., 1960, No. 3353, p. 868.

In trials at Luddington Experimental Station spacing at 1 ft. between plants and 4½ ft. between rows gave the best results. At all distances male plants gave poorer yields than comparable beds containing unsexed plants.

3733. HEIN, A.

Über das Vorkommen einer Virose an Spargel. Vorläufige Mitteilung. (On the incidence of a virus disease of asparagus. Preliminary communication.)

Z. PflKrankh., 1960, 67: 217-19, illus.

Asparagus plantations near Emmerich, Lower Rhine, proved to be heavily infected.

Brassicas.

(See also 3125, 3127, 3143, 3421, 3704, 3725, 4620, 4625.)

3734. PERSSON, A. R., AND APELAND, J.

Evolutionary and agricultural values of polyploidy with special reference to *Brassica* and *Raphanus*. [Norwegian summary 9 lines.]

Meld. Norg. LandbrHøgsk., 1960, 39(1): 1-25, bibl. 61, illus.

A review, together with some data on brussels sprouts obtained at the Agricultural College of Norway.

3735. RUGE, U.

Anzucht von Brassica- und anderen Jungpflanzen in der Klimakammer. (The raising of brassica and other seedlings in the phytotron.)

Angew. Bot., 1959, 23: 190-5, bibl. 8, illus.

Brassica seedlings raised in a phytotron failed to survive the first few weeks, unless the chamber was continuously supplied with fresh air. It was also found that brassica seedlings require light of the same spectral composition as other seedlings already studied. *Mirabilis* and *Petunia* seedlings were less particular as regards the spectral composition of light.

3736. NORTH, C., AND PRIESTLEY, W. G.

Problems in breeding brussels sprouts

(*Brassica oleracea gemmifera*) at Mylnfield.

From abstr. in *Heredity*, 1960, 14: 221.

Aims, techniques and the possible commercial use of male-sterile plants to produce F₁ hybrid seed are discussed. Preliminary experiments on the artificial induction of male sterility by chemical sprays have given promising results.

3737. JOHNSON, A. G.

New breeding methods for brussels sprouts.

N.A.A.S. quart. Rev., 1959, 11: 53-9, bibl. 5.

Progeny testing, inbreeding and hybridization are discussed. Inbreeding followed by hybridization has increased the marketable crop by as much as 66%.—*Nat. Veg. Res. Stat.*, Wellesbourne.

3738. WEBSTER, A. B.

Results of trials at Levin with nine varieties of brussels sprouts.

N.Z. Comm. Gr., 1959, 15(4): 14-15, illus.

Jade Cross proved to be the best all-round variety. Katskill and Irish Elegance 43/58 also gave heavy yields, and the best quality sprouts were obtained from Irish Elegance 46/52 and 40/58. The 9 varieties are briefly described.

3739. THOMAS, W. O.

Cabbage variety tests reported.

Miss. Fm Res., 1959, 22(10): 4.

Early Round Dutch and Glory of Enkhuizen produced the highest yields with 14.0 and 12.7 tons per acre and heads averaging 3.0 and 3.5 lb., respectively. Regular Round Dutch, the most popular variety, yielded 10.2 tons per acre averaging 2.2 lb. per head. Resistant Glory produced a large head, Early Glory proved suitable for hill land, and Marion Market and Bonanza were late maturing. Greenback was early maturing and seemed well suited to local conditions.

3740. LEVITT, J.

Bound water and frost hardiness.

Plant Physiol., 1959, 34: 674-7, bibl. 6.

Early Jersey Wakefield cabbage seedlings hardened by exposure to a temperature of 3° C. for 1-8 weeks subsequently had a higher leaf bound water content than unhardened material.—*Univ. Mo.*, Columbia.

3741. MCCUBBIN, E. N.

Fertilizer requirements of cabbage.

A.R. Fla agric. Exp. Stats, 1957-58, p. 393.

A soil pH of 6.1 was found to be optimal for cabbages, and at this reaction the highest yield was obtained from one side dressing with nitrate of soda 18 days after transplanting.

3742. PARSONS, C. S.

Effects of temperature and packaging on the quality of stored cabbage.

Proc. Amer. Soc. hort. Sci., 1959, 74: 616-21, bibl. 6.

Cabbage was stored in perforated and non-perforated polythene (2.0-mil) crate liners and in unlined crates for various periods at 32°, 38° and 45° F. Cabbage kept equally well at 32° and 38° F. for periods up to 8 weeks. Cabbage stored at 45° deteriorated more rapidly than that stored at the lower temperatures. Approximately 80% of the cabbage in storage remained edible after 8 weeks

at 32°, 6 weeks at 38°, and 4 weeks at 45°. Storing cabbage at a relative humidity of 92% did not prevent desiccation, and the heads wilted badly in unlined crates, where weight losses as great as 13% were recorded after 7 or 8 weeks. Cabbage stored in polythene liners, on the other hand, lost negligible amounts of moisture and remained crisp throughout the 8-week test period. No difference was observed between losses occurring at 32°, 38° and 45° F. Trimming losses were less in non-perforated liners and liners perforated with eight $\frac{1}{4}$ -inch holes than in unlined crates. The fresh green colour of cabbage was retained for the longest periods at low storage temperatures and in polythene liners. The use of polythene liners was beneficial at all the experimental temperatures for prolonging the storage life and maintaining the original quality of cabbage. Some ventilation of the liners is recommended to prevent any excessive modification of the storage atmosphere. [Author's summary. For a preliminary report, see *H.A.*, 29: 1417.]—U.S. Dep. Agric., Beltsville, Md.

3743. SALTER, P. J.

The growth and development of early summer cauliflower in relation to environmental factors.

J. hort. Sci., 1960, 35: 21-33, bibl. 17, illus.

Analyses were made of the growth and development of whole plants and curds of early summer cauliflower grown under variable climatic conditions in the field. Accumulated measurements of the different climatic factors making up the weather were used to provide "time" scales against which to plot the growth of the plants. This enabled comparisons to be made of plant growth from year to year and provided information on the relative importance of certain of the variables in influencing growth and development. Growth of the early summer cauliflower plant, from germination in October until the curd was mature in June, was shown to be exponentially related to accumulated day-degrees above a base temperature of 42° F., the growth curve until flowering time being logistic in form. The growth of the curd was also closely related to accumulated temperature in both years, and the relationship between curd growth and leaf growth was allometric until the curd was mature. The time of curd maturity was coincident with that of maximum leaf weight, progressive senescence of the leaves occurring thereafter. [Author's summary.]—Nat. Veg. Res. Stat., Wellesbourne, Warwick.

3744. MIYAZAKI, Y.

Changes in some physiological properties during the growth and development of cauliflowers, *Brassica oleracea* var. *botrytis*. [Japanese, with English summary $\frac{1}{2}$ p.]

J. hort. Ass. Japan, 1959, 28: 157-64, bibl. 11.

Variation in the water content and specific gravity

of the leaf blade and petiole tissue and characteristics of expressed cell sap.

3745. ALEXANDER, A. G., AND STARK, F. C.

Growth of cauliflower as influenced by nitrate, calcium, and molybdenum relationships.

Proc. Amer. Soc. hort. Sci., 1959, 74: 607-15, bibl. 15, illus.

High nitrate levels were found to have a depressing effect on the growth of cauliflowers. This growth depression did not occur when the level of Ca was also high. The greatest growth occurred when N and Ca levels were both high. When either N or Ca was low, increasing the concentration of the other failed to increase plant growth. The high-N, low-Ca plants showed a ragged, deformed condition similar to that described as whiptail, although the Mo levels employed were too high to permit Mo deficiency. A Ca-Mo interrelationship, however, did appear to be involved in the problem, because raising the Mo level promoted growth and reduced foliage malformation when Ca was low, but not when Ca was high. It is concluded that the acid soil commonly associated with whiptail may contain insufficient available Ca, as well as Mo, for optimum growth. The beneficial use of Ca compounds in correcting whiptail may thus be due in part to an improved Ca-Mo balance.—Univ. Md, College Park.

3746. SAUERBECK, D.

Auswirkung einer Molybdändüngung auf den Molybdäengehalt und die Zusammensetzung verschiedener Kulturpflanzen. (The effect of a molybdenum application on the molybdenum content and the composition of several cultivated plants.)

Z. PflErnähr. Düng., 1958, 80: 203-17, bibl. 50.

Applications of sodium molybdate at the rate of 4 kg./ha. for the cure of whiptail generally exceed the requirements of cauliflower and are not fully absorbed by the crop. The largest part of the application remains in the soil and thus affects the subsequent crops in the rotation. The author suggests that the amounts of Mo applied to cauliflower could be greatly reduced either by treatment of the seed-bed or by foliar application or by reducing field applications to 500 g. sodium molybdate per hectare. Liming is often a better method of making Mo available in the soil. Data are tabulated on the effect of Mo on the composition of various vegetables.—AgrikChem. Inst., Univ. Bonn.

3747. KING, E. M.

Swede turnip culture.

Hort. Circ. B.C. Dep. Agric. 85, 1959, pp. 7, illus.

Notes on varieties, culture, pest and disease control, harvesting, grading, storage and waxing of swedes.

3748. WALLACE, J. O.

Swede and turnip varieties.

N.Z. J. Agric., 1959, 99: 332.

Brief notes on Government-approved varieties.

3749. FITZGERALD, P. H.

The X-ray sensitivity of *Brassica rapa* L. seeds.

N.Z. J. agric. Res., 1959, 2: 1257-61, bibl. 8.

Brassica rapa [turnip] seeds were subjected to doses of X-rays from 10,000 to 100,000 r. The higher doses caused a small but significant decrease in seed germination. The survival of plants, 108 days after sowing, from seeds which had received the highest dose was approximately 15% of the survival of the control plants. The LD 50 for *B. rapa* seeds was about 75,000 r., and the critical dose for mutation breeding purposes was about 80,000 r. The curve relating plant survival to dose of X-rays was sigmoidal and characteristic of about 8 or 9 hits. While this might indicate a critical number of meristematic cells which have to be killed to cause embryo death, it was considered that the dose/survival relationship was complicated by lethal physiological effects of the X-irradiation. [Author's summary.]-D.S.I.R., Christchurch.

3750. REITH, J. W. S.

Fertilizer placement for swedes and turnips.

Emp. J. exp. Agric., 1959, 27: 300-12, bibl. 11.

Placement of ammonium sulphate to the side of the seed row gave results similar to broadcasting, but placing it in bands directly below the seed sometimes reduced both yield and stand, especially in dry weather. The best position for placing superphosphate was directly below the seed at a depth of about 3 to 3.5 in. Placing low to medium amounts of P in this position generally gave substantially higher yields than broadcasting, particularly on soils derived from basic igneous rocks. Placement to the side of the row was appreciably inferior to bands directly below the seed but was often superior to broadcasting. In these experiments there was no advantage or disadvantage from placing muriate of potash at a depth of 3 to 3.5 in. directly below the seed. There was no interaction between the broadcasting and placing of superphosphate and muriate of potash. It is not advisable to place a mixture of sulphate of ammonia and muriate of potash, supplying 40 lb. N and 100 lb. K₂O per acre, directly below the seed, but placement at 2 in. to the side of the seed was safe and gave similar results to broadcasting. Placing NPK mixtures either below or at the side was superior to broadcasting only on some soils. [From author's summary.]-Macaulay Inst. Soil Res., Aberdeen.

3751. BOWERS, J. L., AND VOSE, H. H.

Nitrogen fertilization of turnip greens.

Ark. Fm Res., 1959, 8(6): 11.

Shogoin turnips were used to test the effects of: (1) different sources of N, (2) method of application, (3) time of application and (4) level of N. The greatest yield increase was obtained when N was increased from 30 to 60 lb./acre and in some cases to 90 lb./acre. In a cool growing season the best results were obtained with an early application of N either broadcast or applied in furrows or rows. Nitrate of soda produced higher yields than ammonium nitrate or any of the other N sources tested.

3752. THOMPSON, J. F., MORRIS, C. J., AND GERING, R. K.

The effect of mineral supply on the amino acid composition of plants. [German and French summaries 16 lines each.]

Qual. Plant. Maveg., 1960, 6: 261-75, bibl. 11.

The protein fraction of turnip leaves was analysed for constituent amino acids. It was found that there were considerable differences in protein level between mineral-deficient and normal leaves, but that the relative composition of the protein fraction was only slightly affected. The non-protein amino acids were profoundly influenced by mineral nutrition. The differences in amino-acid concentrations suggested that the lack of various macronutrients affected the metabolism of amino acids in many ways. [From authors' summary.]-U.S. Dep. Agric., Ithaca, N.Y.

3753. MOODY, R. W.

Boron for swedes and lucerne.

N.Z. J. Agric., 1959, 99: 339, illus.

To reduce brown heart in swedes 10 lb. per acre of borax in mild cases and 20 lb. per acre in severe cases are recommended.

3754. SMITH, H. C., AND GIESEN, H. J.

Control of cauliflower mosaic virus.

N.Z. Comm. Gr., 1960, 15(7): 1, 3-4, illus.

Plants sprayed 3 times in January with a mixture of 0.2% nicotine sulphate and 0.2% lindane, or with 0.14% methyl demeton (Metasystox at 20 oz./acre) showed much less severe symptoms of this aphid-borne virus disease than unsprayed plants. Sprayed plots produced a much higher percentage of marketable curds, and the average curd weight was also increased.

3755. HEITEFUSS, R., AND OTHERS.

Electrophoretic and immunochemical studies of proteins in cabbage infected with *Fusarium oxysporum* f. *conglutinans*.

Phytopathology, 1960, 50: 198-205, bibl. 24, illus.

Immunological analysis revealed up to 7 antigenic components in protein extracts of infected susceptible cabbage seedlings, compared with 4 components in susceptible healthy, resistant healthy, and resistant inoculated seedlings. It is suggested that the additional substances were formed by infected plant cells.—Univ. Wis.

3756. HEITEFUSS, R., AND FUCHS, W. H.
Untersuchungen zur pathologischen Physiologie von *Peronospora brassicae* (Gäum.) auf *Brassica oleracea*. (*Studies of the pathological physiology of Peronospora brassicae on Brassica oleracea*.) [English summary $\frac{3}{4}$ p.] *Phytopath. Z.*, 1960, 37: 348-78, bibl. 76.
Changes in the metabolism of cabbages following infection.
3757. CROXALL, H. E.
Club root of Brassicae.
N.A.A.S. quart. Rev., 1959, No. 45, pp. 20-4, bibl. 11.
A review.
3758. McLEAN, D. M.
Sclerotinia stalk rot of cabbage seed plants.
Stats Circ. Wash. St. agric. Exp. Stats 359, 1959, pp. 4, illus.
Calcium cyanamide is recommended for the control of *S. sclerotiorum*. It either decomposes the sclerotia or prevents the formation of apothecia and should be applied directly and uniformly to the soil at 800-1,000 lb./acre. It is toxic to most plants and should not be used on seedlings, but it may be applied when the cabbage seed plants are about waist high. Calcium cyanamide promotes growth, delays seed maturation but increases yields when applied at the rate of 1,000 lb./acre. Mechanical methods of application and the life history of the fungus are discussed.
3759. GENUNG, W. G.
Biology and control of insects attacking cruciferous crops in Florida.
A.R. Fla agric. Exp. Stats, 1957-58, pp. 273-4.
Endrin emulsifiable concentrate gave the best control of cabbage looper [*Trichoplusia ni*], followed by a combination Kepone w.p. and Systox e.c. Treatments which contained demeton gave excellent control of cabbage aphid [*Brevicoryne brassicae*] and green peach aphid [*Myzus persicae*].
3760. DE FLUITER, H. J.
Die Bekämpfung von *Brevicoryne brassicae* L. in Rosenkohl mit organischen Phosphorverbindungen. (**The control of Brevicoryne brassicae in brussels sprouts with organic phosphorus compounds.**)
Reprinted from *Verhandl. IV. int. PflSch.-Kongr. Hamburg*, 1957, 1959, Vol. 1, pp. 787-93.
Demeton, methyl-demeton and thiometon, which are translocated in the vessels, gave excellent results against *Brevicoryne brassicae* on brussels sprouts. Sprouts harvested 30 days or more after the treatment did not contain any spray residues. In the Netherlands, however, the use of these chemicals is not permitted.—Inst. PlZiekt. Onderz., Wageningen.
3761. ANDRES, L. A., REYNOLDS, H. T., AND FUKUTO, T. R.
The use of systemic insecticides for control of the cabbage aphid on cabbage and cauliflower.
J. econ. Ent., 1959, 52: 1045-50, bibl. 8.
Seed-coat applications of Bayer 19639 (Di-Syston) and Thimet on activated charcoal at 4 lb. of toxicant per 100 lb. of seed caused a reduction in plant stand. Granulated Bayer 19639 and Thimet applied to the seed furrow at $\frac{1}{4}$ lb. per acre controlled cabbage aphid (*Brevicoryne brassicae*) for 2 months with no apparent reduction in stand. Bayer 19639 applied at about the same rate as a spray to the seed furrow also controlled aphids for 2 months. Granulated Bayer 19639 applied to the transplant furrow at 1 and 2 lb. per acre gave good control for at least 2 months, and when applied directly to infested foliage at $\frac{1}{4}$ lb. per acre it controlled aphids within 5 days and remained effective for 17 days. Thimet gave similar results in both cases but was not effective over as long a period. Both insecticides applied at transplanting or soon after had disappeared from cabbage heads by harvest time.—Univ. Calif., Riverside.
3762. PHILLIPS, M. A., AND COLLINS, M. G.
A satisfactory addition to the armoury.
Grower, 1960, 53: 413.
Megatox, containing 3 oz. fluoroacetamide with a wetting agent in 1 pint, applied to sprouts at rates of $\frac{1}{2}$ and 1 pint per acre in 100 gal. reduced the aphid population by 99.5% and the number of infected plants by 83%. Satisfactory control was also obtained on cauliflower.
3763. MORRIS, R. F.
Control of root maggots in swede turnips in Newfoundland with heptachlor and aldrin and the effect on parasites and overwintering pupae.
J. econ. Ent., 1960, 53: 65-7, bibl. 3.
Furrow applications of granulated heptachlor at 2, 3 and 4 lb. of toxicant per acre gave an average control of 78, 88 and 89%, respectively, of root maggots (*Hylemyia* spp.) in swede turnips over a 3-year period; granulated aldrin at 2, 3, 4 and 5 lb. gave 63, 71, 76 and 79% control. Ninety-one to 100% of the roots in the heptachlor treated plots and 80 to 98% in the aldrin plots were marketable compared with 29 to 40% in the untreated checks. Both chemicals, particularly at the higher rates of application, caused high mortality in overwintering pupae. The insecticides eliminated the parasite *Aleochara bilineata* and reduced parasitism of the pupae by *Trybliographa rapae*. [From author's abstract.]—Exp. Fm, St. John's West, Newfoundland.

3764. NIKOLOVA, V., AND POPOVA, V.

New possibilities for the control of the cabbage fly. [Bulgarian.]

Bull. Plant Prot., Sofia, 1957, 6(1): 29-32.

Dusting around the plants with 12% BHC during the deposition of the eggs and spraying the base of the stalks with 2% BHC decreased the incidence of *Hylemia brassicae* from 57% to 6.8%.

3765. THOMAS, P. R.

Control of swede midge on savoys.

Plant. Path., 1960, 9: 25-8, bibl. 4, illus.

An economic method that will give complete control of *Contarinia nasturtii* does not seem to be a practicable proposition for a slowly maturing crop of low value, such as savoys. Partial chemical control was obtained by completely dipping the plants in a 0.05% dieldrin solution at planting-out time and by weekly applications of a 0.1% dieldrin spray. [See also *H.A.*, 29: 419.]—N.A.A.S., Starcross, Exeter.

Celery.

(See also 3705.)

3766. HONMA, S.

A method for evaluating resistance to bolting in celery.

Proc. Amer. Soc. hort. Sci., 1959, 74: 506-13, bibl. 6.

Two methods of determining the amount of cold exposure needed to separate bolters from slow bolters.

3767. JANES, B. E.

Effect of available soil moisture on root distribution, soil moisture extraction and yield of celery.

Proc. Amer. Soc. hort. Sci., 1959, 74: 526-38, bibl. 11, illus.

In a 2-year experiment celery was grown at 4 levels of soil moisture, namely, no irrigation and irrigation to return the soil to field capacity when it had been reduced to 40%, 60% and 80% of the available moisture at field capacity. Most of the celery roots were confined to the top 10-12-inch layer of soil, but a few roots penetrated to a depth of 30 inches. Water was most readily absorbed from near the base of the plant. As soil moisture was depleted near the plant, roots progressively farther away, both vertically and laterally, became active in absorbing water. When soil moisture was depleted to 40% of that available at field capacity, the growth rate of the celery was retarded, resulting in small plants of poor quality.—Storrs agric. Exp. Stat., Univ. Conn.

3768. CANNELL, G. H., TYLER, K. B., AND ASBELL, C. W.

The effects of irrigation and fertilizer on yield, blackheart, and nutrient uptake of celery.

Proc. Amer. Soc. hort. Sci., 1959, 74: 539-45, bibl. 15.

Studies on the irrigation of celery in relation to fertilizer treatments showed that yields increased significantly with decreased soil suction. The percentage of blackheart-affected plants increased significantly with the drier moisture treatments and with increased fertilizer rates. Leaf concentrations of Ca, Mg, N and Mn increased with the drier moisture treatments. P, B and Mo decreased with higher suction. The phosphate content in the petioles was increased significantly in the lower suction treatments. Nitrate N for the first sampling date was higher in the lower suction treatments. This trend was reversed for samples taken at later dates. Mg, P, N and Mn were increased significantly with higher fertilizer rates. Na, K, B, Mo and Zn decreased significantly with increased fertilizer treatments for all petiole samples taken during the experiment. The phosphate concentration of petioles was increased with the higher fertilizer treatments for the last 2 or 3 sampling dates. [Authors' summary.]—Univ. Calif., Riverside.

3769. BURDINE, H. W.

A study of magnesium deficiency chlorosis in certain varieties of green celery.

Proc. Amer. Soc. hort. Sci., 1959, 74: 514-25, bibl. 17.

See *H.A.*, 27: 1458.

3770. DARBY, J. F.

Control of cercospora blight of celery.

A.R. Fla agric. Exp. Stats, 1957-58, p. 183.

Significant control of *Cercospora apii* and yield increases resulted from applying the following chemicals (listed in descending order of effectiveness): Dyrene (2 lb./100 gal.), maneb (1.5 lb.), nabam plus ferbam (1 lb. + 1 lb.), Phytoactin (100 p.p.m.), Omadine zinc salt (2 lb.) and ziram (2 lb.). [See also *H.A.*, 28: 2563.]

3771. DARBY, J. F., MOORE, W. D., AND ELLISTON, R. A.

Control of damping-off and root rots of vegetable crops.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 192-3 and 305-6.

An emulsifiable mixture of allyl alcohol (40 gal./acre) and Nemagon 50% (14 gal./acre), applied as a drench in water to the surface of a celery seed-bed, gave excellent control of soil pests. Incorporating 2 tons per acre of cow manure, peat, castor pomace or tobacco stems into a sandy soil, 6 weeks before fumigation with methyl bromide or chloropicrin or the drench treatment, significantly increased the germination and general appearance of celery in the seed-beds. Of several chemicals used as soil drenches at the time of planting, PCNB, captan and a combination of these two produced significant increases in the stand of beans, reduced the amount of damping-off and the per-

centages of *Rhizoctonia* and *Pythium* stem lesions and increased yields as compared with the controls. A combination of allyl alcohol, formaldehyde and urea gave somewhat better disease control but no appreciable increase in yields.

3772. HALL, C. B., AND BURDINE, H. W.
Evaluation of factors determining celery quality.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 113 and 281.

Two short notes are presented. In the first work on the chemical constituents of celery is outlined, and in the second the effects of harvesting at 4 stages of maturity on yield, pithiness, petiole thickness, rib length and cracking are reported.

3773. SHOWALTER, R. K.
Control of butt discoloration of celery.

A.R. Fla agric. Exp. Stats, 1957-58, p. 115.

The application of a hot iron to the freshly cut celery butts usually prevented darkening when they were kept for 2 weeks at 33-40° F.

3774. FAROOQ, M. O., VARSHNEY, I. P., AND RAHMAN, W.

On the presence of apiin in Indian celery seeds (*Apium graveolens*).

Naturwissenschaften, 1958, 45: 265, bibl. 7.

Cucurbits.

(See also 3105, 3120, 3157, 3705, 3728, 3889, 4144.)

3775. RHODES, A. M.

Species hybridization and interspecific gene transfer in the genus *Cucurbita*.

Proc. Amer. Soc. hort. Sci., 1959, 74: 546-51, bibl. 6.

3776. CARLSSON, G.

Hammenhögs F₁-sorter i drivgurka. (**Hammenhögs F₁ varieties of glasshouse cucumbers.**) [English summary 11 lines.]

Meddel. Gulläk. VäxtförädlAnst. Hammenhög, 1959, No. 15, pp. 107-12, bibl. 3, illus.

Filia OJO/54 and Final OJO/57 superior to other varieties tested.

3777. BARHAM, W. S., AND WINSTEAD, N. N.

Ashe and Fletcher, two downy mildew and scab resistant cucumbers.

Bull. N.C. agric. Exp. Stat. 409, 1959, pp. 8, bibl. 9, illus.

Breeding, description and field performance [see also *H.A.*, 29: 558d].

3778. KOOMEN, J. P., AND OTHERS.

Rond de teelt van augurken. (**The culture of gherkins.**) [English summary 1 p.]

Meded. Proefst. Groent. Volle Grond 14, 1959, pp. 54, bibl. 10, illus., f. 2.25.

A detailed survey of cultural practices in Holland, with a summary of experimental findings.

3779. CARLSSON, G.

Försök med ympning av växthusgurkor på *Cucurbita ficifolia*. (**An experiment on the grafting of glasshouse cucumbers on *Cucurbita ficifolia*.**) [English summary 9 lines.]

Meddel. Gulläk. VäxtförädlAnst., Hammenhög, 1959, No. 15, pp. 133-5, bibl. 7.

Grafting delayed maturity and reduced yields, despite the plants having rather larger root systems than normal. There were marked differences between 2 strains of *C. ficifolia* tested.

3780. FRÖHLICH, H.

Über die Beziehungen zwischen der Bodenfeuchtigkeit und dem Ertrag der frühen Gewächshausgurke. (**The relationships between soil moisture and yield in early glasshouse cucumbers.**) [English and Russian summaries 9 and 12 lines.]

Arch. Gartenb., 1959, 7: 505-15, bibl. 4.

Early cucumber plants given 600-650 litres of water per plant between January and mid-August produced 20% more cucumbers of improved quality than plants given 300 litres of water during the same period. Medium-early crops required about 500 litres of water between April and the end of August. During the intensive growth period the critical zone of the soil for moisture was 15-45 cm. below the surface.—*Inst. Gartenb. Grossbeeren*.

3781. (BLAKE, C. D.)

Molybdenum deficiency in cucumbers.

Banana Bull., 1959, 22(11): 7.

Affected plants are stunted and the leaves show pale or yellow green colouring along the edge and between the veins, the marginal tissue later dying. A patchy distribution of affected plants is general. Control is achieved by spraying the foliage with $\frac{1}{3}$ oz. of ammonium molybdate or pure sodium molybdate in 3-4 gal. Excessive application must be avoided.

3782. MASUDA, T., AND HAYASHI, K.

Studies on the thickening growth of melon fruits. I. On the Honey Dew and New Melon.

[Japanese, with English summary 1½ p.] *Sci. Rep. Fac. Agric. Okayama Univ.*, 1959, No. 14, pp. 71-9, bibl. 19.

From measurements of wall thickness and cell size it was concluded that cell division finished about 5 days after anthesis in Honey Dew and 3-4 days in New Melon. Fruit and cell growth measurements are presented in detail in graphs and tables with English captions.

3783. ŽOLKEVIČ, V. N., AND KORECKAJA, T. F.

Metabolism in pumpkin roots during soil drought. [Russian, with English summary ½ p.]

Fiziol. Rast., 1959, 6: 686-98, bibl. 37, illus.

Prolonged drought caused retardation of gluco-lysis, the Krebs cycle and amination in pumpkin roots. The concentration of acid-soluble organo-phosphorus compounds, including ATP, and of nucleic, organic and amino acids decreased. Reduced metabolic activity led to an accumulation of sugars in the roots and to their partial retrans- location to the shoots through the sap. Hence to determine the metabolic activity of the roots an analysis of the ascending sap as well as of the roots themselves is required.

3784. HILLYER, I. G., AND WITTWER, S. H.

Chemical and environmental relationships in flowering of Acorn squash.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 558-68, bibl. 14, illus.

Maleic hydrazide, temperature and day-length treatments, applied separately and in various combinations to Acorn squash plants, affected the date of appearance of flowers, number of nodes preceding the first flowers and total numbers of staminate and pistillate flowers. Complete sup- pression of staminate flowers on plants grown in the greenhouse was obtained by foliar sprays of MH at 250 or 350 p.p.m. applied at the expansion of the first leaf and again at the fourth and fifth leaf stages. In the field, however, 750-1,000 p.p.m. were needed for comparable results. A significant reduction or complete suppression of staminate flowers by MH was achieved only under conditions of short days (13 hrs. or less) and low temperatures (60° F. or below). Morphological observations revealed that MH suppressed the growth of terminal meristems and the development of pollen grains in the androecia of staminate flower buds.—South. Ill. Univ., Carbondale, and Mich. St. Univ., East Lansing.

3785. GREEN, C. H.

Effects of ploidy differences on horticultural characteristics and disease resistance in watermelons.

Diss. Abstr., 1959, **20**: 1519, being *L.C. Card No. Mic.* 59-4144 of 118 pp.

Tetraploids of the watermelon varieties Klondike R-7, Purdue Hawkesbury, Early Bird and Early Canada were hybridized with diploids to produce triploids, and plant and fruit characteristics and *Fusarium* wilt resistance were studied for all 3 groups. The results show that in breeding for commercial triploid (seedless) watermelons it was not possible to predict the desirability of the triploid from the performance of its parents. Even though the parents used were acceptable varieties none of the resultant triploids was com- mercially acceptable. Better triploids were pro- duced by crossing 2 distant parents than by crossing closely related parents. A comparison of tetra- ploid and triploid Klondike R-7 with a resistant diploid of the same variety revealed no increase

in the *Fusarium* wilt resistance of the polyploids.—Purdue Univ.

3786. LAZO, F. D.

Growing seedless watermelon.

Philipp. J. Agric., 1956 (issued 1959), **21**: 87-101.

Tetraploids induced by a 2% colchicine solution, crossed with diploids to produce seedless triploids.

3787. CRALL, J. M.

Effect of seed source on watermelon maturity.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 555-7.

In trials carried out over 3 years to compare watermelons grown from seed produced (i) in Florida, and (ii) in other states (California, Texas, Oklahoma and Colorado), no significant differ- ences were found in time of maturity, stand, plant vigour, mean weight of first melons harvested or occurrence of gummy stem blight (*Mycosphaerella citrullina*). In one year, however, significant differences were noted in time of maturity of water- melons grown from seed obtained from different sources in Florida.—Fla agric. Exp. Stats, Lees- burg.

3788. NETTLES, V. F., HALSEY, L. H., AND LUNDY, H. W.

Fertilizer requirements of watermelons.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 172-3 and 374.

At Gainesville 500 lb. of 6-8-8 fertilizer per acre produced 780 watermelons weighing 18,330 lb., and 1,000 lb. per acre 1,080 watermelons weighing 26,568 lb. At the Suwanee Valley Station, using the same variety, 500 lb. of 6-8-8 fertilizer per acre produced 423 watermelons weighing 10,025 lb. and 1,000 lb. per acre 480 watermelons weighing 11,684 lb. At neither place were there any differ- ences in yield associated with different sources of nitrogen. [See also *H.A.*, 29: 2467.]

3789. HENSZ, R. A., AND MOHR, H. C.

Functional male sterility in watermelon induced by chemical treatment.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 552-4, bibl. 4, illus.

Five different chemical growth regulators were tested on watermelon plants for possible effects on male fertility or flower sex ratio. Only two produced evident effects: (1) Gibberellic acid, which increased the ratio of staminate to pistillate flowers from 6 : 1 (normal) to 10 : 1, and (2) sodium alpha, beta-dichloroisobutyrate (FW-450), which pre- vented the opening of the mature staminate buds. The ratio of functional staminate blossoms to functional pistillate blossoms was 10 : 31 for 9 plants treated with 0.5% FW-450, whereas 9 control plants produced a ratio of 675 : 45 during the same 5-day period. The effect of FW-450 in preventing the opening of staminate buds appears

to be localized in the tip of the bud. Pinching off the tip permits immediate unfurling of petals. Anthers dehisce with the production of apparently normal pollen inside mature unopened staminate buds. No deleterious effects upon female fertility were associated with the application of FW-450. [Authors' summary.]—Agric. mech. Coll. Texas, College Station.

3790. SHOWALTER, R. K.

Watermelon damage from field to car loading.

A.R. Fla agric. Exp. Stats, 1957-58, p. 108.

Insoluble solids in ripe Charleston Gray watermelons ranged from 0.3 to 0.5%. Soluble solids from the centre of the melons averaged 2% higher than from a complete cross section. Specific gravity decreased more after storage at room temperatures than after storage at 50° F. [For an earlier report, see *H.A.*, 29: 442.]

3791. BLAKE, C. W.

Mildew control in cucurbit crops.

Banana Bull., 1959, 22(10): 7.

Advice on control of powdery and downy mildews.

3792. CONOVER, R. A.

Control of cantaloupe diseases.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 369-70.

Phaltan + ML 104 was outstanding against downy mildew (*Pseudoperonospora cubensis*) on cantaloupes. Against powdery mildew (*Erysiphe cichoracearum*) the inclusion of Karathane in every zineb spray was the best treatment. [For earlier work, see *H.A.*, 29: 438.]

3793. SCHENCK, N. C.

Investigations on and control of fungus diseases of watermelons.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 397-8.

In a comparison of 9 fungicides for the control of gummy stem blight (*Mycosphaerella citrullina*) and leaf spot (*Cercospora citrullina*) maneb, alone or in combination with zineb, was significantly superior to all other compounds including zineb used alone. Of the new materials tested, Tennam was superior, Omadine equal and Actidione S and Amobam inferior, to zineb. Seed artificially infected with *M. citrullina* was completely freed from the fungus after soaking for 20 min. in water at 62° C., but germination was much reduced. Soaking the seed in Omadine at 500 p.p.m. for 48 hrs. gave similar results without affecting germination.

3794. RAYMOND, F. L., AND OTHERS.

Filamentous fungi from blossoms, ovaries, and fruit of pickling cucumbers.

Mycologia, 1959, 51: 492-511, bibl. 31, illus.

Species which cause softening of brined cucumbers

by introducing pectinolytic and cellulolytic enzymes into the vats.

3795. BRAITHWAITE, B. M.

Insect control on cucurbits.

Banana Bull., 1959, 22(10): 7.

Sprays and dusts to control red spider mites and 28-spot ladybird beetles on rock melons and cucumbers.

3796. SRINIVASAN, P. M.

Guard your bitter gourd against the fruit fly.

Indian Fmg, 1959, 9(9): 8, illus.

Dacus cucurbitae was controlled by 5 applications of nicotine sulphate at 0.1% or endrin at 0.02%.

3797. BEROZA, M., AND OTHERS.

New synthetic lures for the male melon fly.

Science, 1960, 131: 1044-5, bibl. 6.

Several para-substituted derivatives of 4-phenyl-2-butanone, particularly 4-(p-acetoxypheyl)-2-butanone which attracts *Dacus ochrosiae* males as well as *D. cucurbitae*.

Legumes—beans.

(See also 3106, 3121, 3122, 3125, 3144, 3145, 3147, 3153, 3171, 3174, 3498, 3704, 3771, 3829, 3915, 4318, 4376, 4616.)

3798. RIZZOTTO, H.

Il fagiolo di Lamón. (Lamón beans.)

Agric. Venezie, 1960, 14: 24-8, illus.

The 4 races of this bean are described. Composition data for seeds of the Spagnolit type show a very low cellulose content and a high value for phaseoline. Soil and cultural requirements are discussed, and the types Spagnolit and Calonega are recommended to growers.

3799. WEBER-DAHLMANN, M.

Ein Beitrag zur Sortendiagnose von *Phaseolus vulgaris* (var. *nanus* Mart.). (A contribution towards the identification of *Phaseolus vulgaris* var. *nanus* varieties.)

Saatgut-Wirtschaft, 1960, 12: 10-13, illus.

In the seedling stage.

3800. PARSONS, P. A., AND ALLARD, R. W.

Seasonal variation in lima bean seed size: an example of genotypic-environmental interaction.

Heredity, 1960, 14: 115-23, bibl. 8.

3801. POWRIE, W. D., ADAMS, M. W., AND PFLUG, I. J.

Chemical, anatomical, and histochemical studies on the navy bean seed.

Agron. J., 1960, 52: 163-7, bibl. 19, illus.

The seed coats, cotyledons and embryonic axes constituted 7.7%, 90.5% and 1.8%, respectively, of the dry matter of mature beans. The protein contents of these organs were 4.8%, 27.5% and 45.6%, and the starch content of the cotyledons was 39.3%.—Mich. agric. Exp. Stat., E. Lansing.

3802. VEISS, O., AND POWRIE, W. D.

Some properties of navy-bean starch granules.
Quart. Bull. Mich. agric. Exp. Stat., 1959,
42: 386-92, bibl. 8.

Size of granules in fresh and processed beans of 3 varieties.

3803. WATERS, E. C., JR., AND ATKIN, J. D.

Performance of snap bean (*Phaseolus vulgaris*) seedlings having transversely broken cotyledons.

Proc. Amer. Soc. hort. Sci., 1959, 74: 591-6, bibl. 18, illus.

Experiments comparing seedlings with complete cotyledons and those with varying amounts of cotyledonary tissue lost as a result of naturally occurring transverse breakage indicated that a loss of cotyledonary tissue resulted in smaller seedlings, fewer pods and lower yield per plant. Since seedlings with broken cotyledons are now considered to be normal [according to the rules of the Association of Official Seed Analysts], the above relationships suggest that a revised interpretation of normal seedlings will be needed if official laboratory germination tests are to indicate accurately the potential planting value of snap bean seed. [From authors' conclusions.]—N.Y. St. agric. Exp. Stat., Geneva.

3804. CELESTINO, A. F., AND DEANON, J. R., JR.

Snap beans—I. The influence of planting dates on dry bean yield of bush and pole snap bean varieties.

Philipp. Agric., 1959, 43: 379-85, bibl. 7.

In the Philippines yields from November plantings were 75–130% greater than those from February plantings in bush beans, and 12–70% greater in pole beans. Wade, Contender and Improved Tendergreen gave the highest yields among the bush varieties, Tropic Wonder and Kentucky Wonder among the pole varieties.

3805. CARDONA A., C.

Uso de maquinaria en el cultivo de frijol. (The use of machinery in bean crops.)

Agric. trop. Bogotá, 1959, 15: 839-42, illus.

For ploughing, harrowing, levelling, furrowing, sowing and weed control in Colombia.

3806. KRZYSCH, G.

Die Wirkungen verschiedener N-, P- und K-Verbindungen bei Anwendung als Blatt-düngemittel. (The effects of different N, P and K compounds applied as foliage sprays.)
Z. Pflernähr. Düng., 1958, 82: 107-20, bibl. 3.

Dwarf beans were among the plants included in the container trials of P and K salts. Of the P compounds tested $Mg(H_2PO_4)_2$ produced the best response, although the effect of a soil application was even better. Foliage sprays of K produced an increase in yields only if the supply of K in the

soil was low. KNO_3 proved to be the most suitable K compound.—Tech. Univ. Berlin.

3807. PRUMMEL, J.

Rijenbemesting met fosfaat bij stamslabonen. (Placement of phosphate for french beans.)
Tech. Ber. Peulvruchten Studie Combin., Wageningen, 82, 1959, pp. 8, bibl. 2, illus.

When canning beans, variety Processor, were grown in widely spaced rows (67 cm. apart), placement of double superphosphate gave a 7-fold yield increase compared with broadcast application, and also improved the keeping quality of the product. The phosphate was placed on each side of the rows in drills 5 cm. to the side and 3 cm. deeper than the seed.—Inst. Bodenvrucht., Groningen.

3808. VEREŠAGA, A. I.

The influence of changed day length on the growth and development of different forms of bean. [Russian.]

Bjull. Vses. selekc.-genet. In-ta, 1957, No. 3, pp. 21-3, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,370.

Some results are given of the responses of 125 types of *Phaseolus vulgaris*, 4 types each of *P. acutifolius* and *P. lunatus* and one type of *P. multiflorus* to 10- and 24-hr photoperiods.

3809. MACK, H. J., AND LANING, E. R., JR.

Basal defoliation effects on pole beans.

Proc. Amer. Soc. hort. Sci., 1959, 74: 597-600, bibl. 4.

Basal defoliation of runner beans has been found to reduce the incidence of white mould by improving aeration. Moreover, the removal of lower leaves and/or blossoms and pods by chemical means may be necessary if a mechanical harvester is used, which does not effectively harvest beans from the basal 12–15 in. of the plants. It was shown that yields were significantly reduced if pods were allowed to remain on the basal portion of the plants throughout the season. In trials with chemical defoliants over 3 seasons, endothal effectively removed leaves, blossoms and small pods, but reduced yields by 4–35%, as compared with the untreated controls. Potassium cyanate removed leaves but was not effective in removing blossoms and pods, and yield reductions were not statistically significant. Hydrin (an experimental oil) and magnesium chlorate removed leaves, were not particularly effective in removing blossoms and pods, and caused yield reductions of 5–25%. Removal of the basal leaves by hand did not generally reduce yields significantly.—Ore. St. Coll., Corvallis.

3810. GEARD, I. D.

Diseases of french beans and runner beans.
Tasm. J. Agric., 1959, 30: 336-45, bibl. 12, illus.

The most important disease affecting french beans

in Tasmania is halo blight (*Pseudomonas phaseolicola*). The use of seed from disease-free crops is the main method of control. Several fungus diseases, which are of lesser importance, are also described. These are damping-off (mainly *Pythium* spp.), for which seed treatment is recommended; fusarium root rot (*F. solani* f. *phaseoli*) and sclerotinia rot (*S. sclerotiorum*), which are controlled by crop rotation; grey mould rot (*Botrytis cinerea*), which is only important in glasshouses and is controlled by sanitation measures and avoiding the development of cool, moist conditions; anthracnose (*Colletotrichum lindemuthianum*), for the control of which the use of disease-free seed and crop rotation are the most important factors; and rust (*Uromyces phaseoli*), which is of infrequent occurrence. The diseases due to infection with the common bean mosaic virus and the bean yellow mosaic virus are also described and measures recommended for their control. Runner beans are not subject to losses from parasitic diseases in Tasmania, and their main trouble is failure to set pods in the summer owing to the physiological effect of high temperatures.

3811. CONOVER, R. A.

Control of rust on pole beans.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 367-8.

Under conditions of severe rust (*Uromyces phaseoli typica*) infection a sulphur + 3.5% maneb dust applied twice a week at 30 to 50 lb./acre gave the best control and was better than sulphur dust alone. Mild infection was controlled by dusting every 5 days. When spray treatments were used under conditions of severe rust infection, none of the materials tested compared favourably with twice-weekly applications of maneb. Where sprays were only applied once a week, however, P-496 was superior to maneb, and O-3818B and P-404 were equal to maneb.

3812. WALKER, P. T.

Insecticide studies on East African agricultural pests. III.—Seed dressings for the control of the bean fly, *Melanagromyza phaseoli* (Coq.) in Tanganyika.

⁹*Bull. ent. Res.*, 1960, 50: 781-93, bibl. 8.

The bean fly, *Melanagromyza phaseoli*, the larvae of which tunnel in the stems of *Phaseolus vulgaris*, is a pest of this crop in Tanganyika. Field trials there in 1956 on haricot-type beans showed that dressing the seed with chlorinated-hydrocarbon insecticides could prevent attack for at least 30 days after germination; organophosphorus insecticides were less effective. In four further field trials (A-D), in 1957, the insecticides and types of formulation used were aldrin (wetttable powder and emulsifiable concentrate (e.c.)), endrin (e.c.), γ BHC (dry dressing and e.c.), dieldrin (dry dressing and e.c.) and a proprietary organophosphorus systemic (dry dressing). Wet dressings

were applied by treating the seeds with the liquid and drying immediately, and in one treatment aldrin as a wetttable powder was applied dry and the seeds then damped and dried at once. Damage was assessed on an arbitrary scale on trials A and B, and yields measured on trials A, C and D. Results varied between insecticides and under different growing conditions, but wet dressing with endrin at 213 mg. per 100 g. seed, of which about 50% was retained on the seeds, resulted in the lowest damage, amounting to 7.7 compared with 52.6 for the control (no dressing), and the highest yield, amounting to 13.5 units compared with 8.6 for the control. All treatments, except that with the organophosphorus dust, reduced the damage significantly below that in the control. Wet dressings were usually more effective than dry dressings with the same insecticide, as regards both yield and reduction in damage. This may be associated with the better retention of wet dressings, which was shown by the results of chemical analysis of the residues on the seeds left in the drill hopper after sowing. [Author's summary.]—Colon. Pesticides Res. Unit.

3813. SCHVESTER, D., AND MAISON, P.

Essais de traitements sur haricots contre la mouche des semis, *Hylemyia cilicrura* Rond (3^e note). (Trials on treating haricot beans against seed flies *H. cilicrura* (3rd note).)

Phytiat.-Phytopharm., 1959, 8: 23-6.

Lindane and TMTD, both applied either as dry powder, slurry or in a coating of methylcellulose, gave comparable results. Seeds coated with methylcellulose may be stored without either loss of viability or of insecticidal efficiency.—Stat. Zool. Sud-Ouest, Pont-de-la-Maye.

3814. POPOVA, V.

Bean pyralid (*Etiella zinchenella*), a pest of beans. [Bulgarian.]

Bull. Plant Prot., Sofia, 1957, 6(1): 41-3.

An infestation by *E. zinchenella* on leguminous crops in south Bulgaria caused 90% damage to beans [*Phaseolus vulgaris*] and serious damage to other legumes. Early sowing of beans and peas at the beginning of April reduced incidence of the pest by 20%. The infestation was almost eradicated by 3 applications, at 10-day intervals starting at the beginning of pod formation, of 20% DDT, 1% oil emulsion or 0.08% parathion.

3815. ZACHARIAE, G.

Kann sich der Speisebohenenkäfer *Acanthoscelides obtectus* Say als Freilandschädling in Norddeutschland einbürgern? (Can *Acanthoscelides obtectus* become a naturalized pest of beans in the fields of northern Germany?) [English summary 16 lines.]

Z. angew. Ent., 1960, 45: 225-67, bibl. 56, illus.

Life history in relation to climate.

3816. STONE, M. W., AND ANDERSON, L. D.

Experiments on control of the sugar-beet wireworm in southern California bean fields.

J. econ. Ent., 1960, 53: 176-7, bibl. 2.

In 1952 insecticides applied to the soil surface at 35 gal. per acre were immediately disked in. Of 7 materials tested in 2 bean fields the most consistent were dieldrin, DDT and endrin, all giving excellent control of wireworms (*Limonijs californicus*) for 6 years. Toxaphene used in only one field was highly effective and should be further tested.—Agric. Res. Serv., U.S.D.A., and Univ. Calif., Riverside.

3817. KLINGMÜLLER, W., AND LANE, G. R.

Damaging effect of drying on *Vicia faba* seeds.

Nature, 1960, 185: 699-700, bibl. 10.

Broad bean seeds cannot be dried much below their normal water content without injury. In radiobiological work on dry seeds the effect of drying may be important and should be taken into account in interpreting the results.—Univ. Southampton.

3818. AYERS, A. D., AND EBERHARD, D. L.

Response of edible broadbean to several levels of salinity.

Agron. J., 1960, 52: 110-11, bibl. 5.

On the basis of results obtained in the greenhouse, using total top growth as a measure of yield, the broad bean, *Vicia faba*, was found to have a moderate tolerance to salinity. Soil salinity levels corresponding to a conductivity of 6- to 7-millimhos in the saturation extract reduced yields by 50%. [From authors' conclusion.]—U.S. Salinity Lab., Riverside, Calif.

3819. GOTTSCHALK, W.

Untersuchungen über die Befruchtungsverhältnisse von *Vicia faba* mit Hilfe einer früh erkennbaren Mutante. (Pollination studies in *Vicia faba* with the aid of an early recognizable mutant.)

Züchter, 1960, 30: 22-7, bibl. 24, illus.

Under favourable conditions cross pollination occurred in about 40% of the flowers. By interplanting the normal 3-leaflet form with a single-leaf mutant the extent of crossing could be determined at the seedling stage.—Inst. landw. Bot., Univ. Bonn.

Legumes—peas.

(See also 3126, 3133, 3146, 3147, 3159, 3169, 3170, 3814, 3844, 3890, 4607, 4612.)

3820. CARLSSON, G.

Primex/56, en ny tidig sockerärt. (Primex/56, a new early sugar pea.) [English summary 6 lines.]

Meddel. Gullåsk. VaxtförädlAnst., Hammenhög, 1959, No. 15, pp. 113-15, bibl. 3.

The earliest of 45 varieties tested.

3821. HIGHKIN, H. R.

Effect of vernalization on heat resistance in two varieties of peas.

Plant Physiol., 1959, 34: 643-4, bibl. 3.

Individually planted seeds of Unica, a vernalizable heat-sensitive variety, and of L₅, a non-vernalizable heat-resistant variety, were stored for 25 days at 4° C. in the dark. Subsequent growth under controlled conditions was studied in comparison with non-vernalized controls. In both varieties vernalized plants grown at 26° C. were considerably less necrotic, and in Unica the first node to flower was significantly lowered when the plants were grown at 20° C. day and 14° C. night temperatures compared with a constant 26° C. Vernalization had no effect on the flowering of both varieties when these were grown at 26° C. owing to devernalization, nor on the flowering of L₅ when this variety was grown at 20/14° C. The results seem to indicate that the induction of heat resistance by vernalization is independent of the induction of flower formation resulting from the same cold treatment. [See also *H.A.*, 27: 1476.]—Calif. Inst. Technol., Pasadena.

3822. BERRIE, A. M. M.

Abnormal growth and development in pea resulting from exposure to adverse conditions during germination.

Nature, 1960, 185: 626-7, bibl. 1, illus.

In order to find the reason why pea seedlings grown from seeds soaked in water for 48 hr. develop abnormally, seeds were treated in running water, stagnant water and 20% carbon monoxide and compared with controls grown in moist soil. The results indicate that the abnormal development was caused by conditions which affected aerobic respiration, particularly in the meristems of the embryo, and which caused loss of apical dominance or, in extreme cases, death of the terminal bud.—Univ. Glasgow.

3823. SPRAGG, S. P., AND YEMM, E. W.

Respiratory mechanisms and the changes of glutathione and ascorbic acid in germinating peas.

J. exp. Bot., 1959, 10: 409-25, bibl. 26.

3824. REYNOLDS, J. D.

Manuring the pea crop.

Agriculture, Lond., 1960, 66: 509-13, bibl. 9.

Soil analysis can provide a useful guide to fertilizer requirements. N and P applications are generally not justified, but after prolonged wet weather $\frac{1}{2}$ -1 cwt. of sulphate of ammonia per acre, and in acutely P-deficient soils the addition of P, may be beneficial. K applications are commonly beneficial. Potassic-superphosphate with a high K content is a useful source, and experiments have shown that placement of 2-3 cwt. per acre in a band 2 in. to the side of the seed and 1 in. below

it is most profitable.—Pea Res. Stat., Yaxley, Peterborough.

3825. LAWRENCE, J. M., DAY, K. M., AND STEPHENSON, J. E.

Nitrogen mobilization in pea seedlings.

Plant Physiol., 1959, **34**: 668-74, bibl. 25, illus.

During the first 5 days of seedling growth the amount of protein in the cotyledons steadily decreased, whereas in the growing parts it increased. The non-protein nitrogenous constituents in the cotyledons increased during the first 3 days, then decreased, and in the root-shoot axis they increased slowly at first and then rapidly. Amides represented only one-sixth to a half of the free amino-nitrogen, and substantial amounts of peptides were present. Root and shoot shaft tissue had comparatively high concentrations of non-protein nitrogenous compounds, whereas root and shoot tips were very high in protein. [From authors' summary.]—Wash. St. Univ., Pullman.

3826. AHMED, M., AND HASSAN, M. S.

The application of the rapid tissue test for the diagnosis of phosphorus deficiency in the pea plant.

Bull. Cairo Univ. Fac. Agric. **161**, 1957, pp. 13, from *Biol. Abstr.*, Sect. D, 1960, **35**, Abstr. 17,249.

Phosphorus was supplied at 0, 6.8, 34 and 68 p.p.m. in sand culture at thinning time. The P status could be determined in samples taken as early as 16 days later and before any symptoms appeared on the P-deficient plants.

3827. LINCK, A. J., AND SWANSON, C. A.

A study of several factors affecting the distribution of phosphorus-32 from the leaves of *Pisum sativum*.

Plant and Soil, 1960, **12**: 57-68, bibl. 17, illus.

Distribution patterns for the movement of solutes in the phloem from leaves of pea plants were found to be relatively specific. P^{32} applied to the leaf at the first bloom node moved predominantly (to the extent of 50 to 90%) to the pod at the node. Distribution of the translocate from this leaf to pods at higher nodes was negligible. Translocation in the phloem of P^{32} from lower leaf nodes (i.e. 5th or 7th) was predominately downward with little or no accumulation in the pods. The stage of development of the flower markedly affected the distribution pattern of P^{32} supplied to the leaf at the same node. Essentially, no activity moved into either the flower or the vegetative portions of the plant before anthesis and fertilization had occurred in that flower, in contrast to the same plant parts in plants 4 to 6 days past anthesis. The young developing embryos of the pod appear to "control" the movement of P^{32}

from the adjacent leaf. When the metabolic activity of the pod on plants bearing one pod only was lowered by cooling (to 7° C.), the movement of P^{32} to this pod as well as to all other parts of the plant was markedly diminished. This inhibitory effect of the low pod temperature on translocation to the uncooled parts of the plant was rendered inoperative by the presence of a second pod (uncooled) on the plant. Lowering the temperature of the first pod resulted in a substantial increase in the proportion of the P^{32} -labelled translocate moving to the second pod. [From authors' summary.]—Ohio St. Univ., Columbus.

3828. BUSSLER, W.

Manganmangelsymptome bei höheren Pflanzen. (Symptoms of manganese deficiency in higher plants.)

Z. Pflernähr. Düng., 1958, **81**: 225-42, bibl. 21, illus.

Macroscopic and microscopic symptoms with particular reference to peas and some other vegetables.

3829. BUSSLER, W.

Manganvergiftung bei höheren Pflanzen. (Manganese toxicity in higher plants.)

Z. Pflernähr. Düng., 1958, **81**: 256-65, bibl. 14, illus.

Symptoms and effects on metabolism, with particular reference to beans and peas.

3830. ŽUROVSKA, V. JA.

The effect of molybdenum on the yield and quality of peas. [Russian, with English summary $\frac{3}{4}$ p.]

Tr. Akad. Nauk LatvSSR (Mikroelem. v Rasteniev.), 1958, **9**: 151-64, bibl. 19.

Molybdenum, applied alone or with B, to light podzol soils increased enzyme activity, the contents of soluble sugars and protein and the yield of peas. It also increased the P and K contents of the peas. Better results, in terms of yield and quality, were obtained by seed treatment and spraying than by soil application.

3831. WADE, G. C.

Pimple pod virosis of canning peas.

Tasm. J. Agric., 1959, **30**: 311-19, bibl. 12, illus.

The symptoms of the disease, which include pimples on the pods and water-soaked markings on seed testa, are described. Results of trials on the variety Canner's Perfection showed that the virus was transmitted by the aphids *Macrosiphum euphorbiae* and *Myzus persicae*, and by grafting, but sap transmission occurred only with difficulty and seed transmission was not observed. The virus resembled enation mosaic and infected red clover, broad bean and subterranean clover without producing symptoms. The disease has

not been observed since Greenfeast and Coopers have become the main varieties grown in Tasmania.

3832. KLEMENT, Z., AND LEHOCZKY, J.
A borsó baktériumos zsírfoltossága Magyarországon. (**Bacterial blight of peas in Hungary.**) [English and Russian summaries $\frac{1}{2}$ p. each.]

Novénytermelés, 1960, 9: 59-66, bibl. 12, illus.

Pseudomonas pisi appeared on leaves where *Sitona* spp. were feeding, thus suggesting that this disease is transmitted by the weevils.

3833. LABRUYÈRE, R. E., DEN OUDEN, H., AND SEINHORST, J. W.

Experiments on the interaction of *Hoplostaimus uniformis* and *Fusarium oxysporum* f. *pisii* race 3 and its importance in "early yellowing" of peas.

Nematologica, 1959, 4: 336-43, bibl. 5, illus.

Experiments are described which confirmed that neither of these organisms alone can cause serious root rot of peas. Interaction between them, however, can lead to extensive decay of the root cortex. A case is also described in which early yellowing followed DD treatment, traces remaining in the soil possibly making the pea root susceptible to *Fusarium*.—I.P.O., Wageningen.

3834. EWING, E. E.

Factors for resistance to pre-emergence damping-off in pea (*Pisum sativum* L.) incited by *Pythium ultimum* Trow.

Diss. Abstr., 1959, 20: 1518, being *L.C. Card No. Mic.* 59-5304, of 125 pp.

Several pea varieties were found to be resistant to pre-emergence damping-off, when sown either in steam sterilized soils which had been inoculated with *Pythium ultimum* or in the field near Toluca, Mexico. Resistance was shown to be due to the presence in the testa of the basic (fundamental) gene *A* for anthocyanin. This gene worked solely through the testa and its presence in the embryo did not affect resistance. Genetic evidence showed that resistance was associated with the occurrence in the testa of tannin-like, colourless, phenolic compounds which appear to belong to the general category known as leucoanthocyanins. As the probable cause of the horticulturally undesirable darkening upon cooking and the astringent taste of *A* seed coats is a phenolic compound of the same type as that associated with resistance to damping-off, it appears unlikely that resistance can be separated from these undesirable effects.—Cornell Univ.

3835. GETZIN, L. W., AND CHAPMAN, R. K.
Effect of soils upon the uptake of systemic insecticides by plants.

J. econ. Ent., 1959, 52: 1160-5, bibl. 13.

The absorption of some systemic insecticides by peas from 4 soils and 2 sands was measured by

aphid bioassay and anticholinesterase analysis. Greater residues and longer periods of insect kill resulted from soil drench applications to sands and sandy soil than from applications to other soils (silt loam, clay loam and muck). Pea aphid (*Macrosiphum pisi*) control from soil treatments with Phosdrin varied from 2 days on plants grown in loam and muck to 19 days on plants in sand. Likewise, demeton and phorate, formerly designated Thimet, were most effective in the sands and least effective in the muck, with insect kill from 10 to 100% occurring on peas in all soils and sands 41 days after treatment. Schradan was also more effective in treated sands and sandy soils. Because of its slow toxicological action schradan provided low insect mortality when counts were taken 24 hours after the insects were subjected to treated plants. Unlike the other insecticides Isolan was absorbed in greater amounts by peas from the muck than from either of the loam soils. [From authors' abstract.]—Univ. Wis., Madison.

3836. DAUTERMAN, W. C., AND OTHERS.

Persistence of dimethoate and metabolites following foliar application to plants.

J. agric. Food Chem., 1960, 8: 115-19, bibl. 14.

Foliar application of this insecticide to certain plants, including peas, was followed by rapid absorption and decomposition by oxidation and hydrolysis. Only trace amounts of the compound and its oxygen analogue were ascertainable 32 days after treatment. On the peas the major derivative of hydrolysis on and in the surface was phosphoric acid.—Univ. Wis., Madison.

3837. MATSUI, S., ITÔ, S., AND SUGAHARA, Y.

Studies on the maturity of sugar peas for canning in relation to their physical and chemical properties. [Japanese, with English summary $\frac{1}{2}$ p.]

J. hort. Ass. Japan, 1959, 28: 149-56, bibl. 8, illus.

Five varieties harvested at varying times were compared. Oracle had a low specific gravity and contained a small amount of alcohol-insoluble residue, which increased very slowly with ripening; sugar and soluble N contents were high, whereas starch and insoluble N were low, regardless of harvesting time. In a second series of trials most of the peas of Provost and Oracle from successive pickings were graded in the "Fancy" class, whereas those of Alaska and Usui were in the "Standard" or "Second" classes. With Provost and Oracle the peas remained suitable for canning over a long period, giving large numbers of high quality peas even when harvested only once or twice. On the other hand, Alaska and Usui required more frequent harvesting to obtain produce of suitable canning maturity. As canned products Provost and Oracle were superior to Alaska and Usui.

3838. CARLSSON, G.
Några synpunkter på kvalitetsbedömningen av määrgärter för djupfrysning. (**Quality assessment of marrow-fat peas for deep-freezing.**) [English summary $\frac{1}{2}$ p.] *Meddel. Gulläk. VäxtförädlAnst., Hammenhög*, 1959, No. 15, pp. 124-32, bibl. 5.
As the tenderometer readings of the green peas rose, the colour of the frozen product improved but its flavour deteriorated. The colour of the frozen product was not governed entirely by the colour of the fresh peas.
3839. RALLS, J. W.
Flash exchange gas chromatography for the analysis of potential flavor components of peas.
J. agric. Food Chem., 1960, 8: 141-3, bibl. 6.
From the steam distillate of peas nine volatiles were isolated, identified and estimated, but the equivalent mixture of these compounds did not reproduce the characteristic odour of pea distillate.
3840. LEWIN, L. M., AND WAGENKNECHT, A. C.
An inositol phosphatide of peas.
Arch. Biochem. Biophys., 1960, 87: 239-46, bibl. 36.
Obtained from raw, but not dry, peas after they had been in frozen storage (-17.8°C.) for several months.

Lettuce and other salad crops.
(See also 3130, 3705, 4309.)
3841. DADSWELL, D. N.
The way to plot successive lettuce crops.
Grower, 1960, 53: 845-7.
Data collected by the author on a market garden in Kent during 1948-57 have been used to construct a graph relating cutting date to sowing date, which enables outdoor sowings to be timed so as to give a continuous market supply irrespective of seasonal changes in growth rate.
3842. BUTLER, W. L.
Chlorogenic acid of lettuce seeds.
* *Nature*, 1960, 185: 856-7, bibl. 2.
A high content of chlorogenic acid in lettuce seeds is reported. This amount did not change during germination and there was little or no translocation from the cotyledons. This suggests that it has no metabolic function. Its failure to interact with an active polyphenol oxidase that is also present in the seed is discussed.—U.S.D.A., Beltsville, Md.
3843. ATTIA, M. S.
Effect of seedling age and date of transplanting on seedstalk development in two varieties of lettuce.
Alexandria J. agric. Res., 1959, 7: 271-7, from *Document. Bull. nat. Res. Cent. Cairo*, 1959, 5, Abstr. 5-100,928.
Bolting was significantly delayed in the lettuce variety Lobjoits Green by transplanting at 45 instead of 30 days after sowing, and was delayed by 10 days by sowing in late February instead of late January.
3844. RIN'KE, R. S.
The effects of industrial refuse and glass frits containing micro-elements. [Russian, with English summary 1 $\frac{1}{2}$ pp.]
Tr. Akad. Nauk LatvSSR (Mikroelem. v Rasteniev.), 1958, 9: 265-87, bibl. 15.
In field trials on acid soils poor in Mo industrial refuse containing 65% of ferromolybdenum and glass frit containing 59% of Mo increased lettuce yields by 61% and 49%, and pea yields by 50 and 40%, respectively. The accumulation of ascorbic acid, chlorophyll and protein in lettuces and peas was also favourably influenced by the 2 fertilizers. On calcareous loams the application of glass frits containing Zn increased lettuce yields by 26-32%. On podzolic sandy soils the application of glass frits containing Cu, Zn, Mn, Fe and Mo increased lettuce yields by up to 35%.
3845. JENKINS, J. M., JR.
Brown rib of lettuce.
Proc. Amer. Soc. hort. Sci., 1959, 74: 587-90, bibl. 5, illus.
Various treatments were tested to determine their effects upon the incidence of brown rib and tipburn in Great Lakes lettuce. None of the fertilizer treatments corrected the trouble, neither did the use of lime in the soil or calcium chloride sprays on the foliage. Daily overhead sprinkling with water during the latter part of the growing season resulted in a significant reduction in both brown rib and tipburn. This was thought to be due to the cooling effect of the water. Overhead irrigation, however, is not a practical method of control. Tests of breeding lines and varieties showed that some are apparently resistant. Breeding new varieties probably offers the best possibility for the control of both brown rib and tipburn. Brown rib appears to be a physiological disorder that develops as a result of high temperature conditions to which most lettuce varieties are not adapted. [Author's summary.]—N.C. St. Coll., hort. Crops Res. Stat., Castle Hayne.
3846. BLAKE, C. D.
Considerable loss from lettuce mosaic.
Banana Bull., 1959, 22(11): 7.
Control measures suggested are the use of mosaic-free seed and the isolation of seed-beds and plantings. Aphids should be controlled by spraying with 0.025% Metasystox in the seed-bed, or after transplanting, but at least 21 days before picking, with 0.02% diazinon. All plants showing any sign of light green or yellowish leaf mottle should be destroyed.

3847. WAY, J. M., AND KEYWORTH, W. G.

Experiments on the control of *Botrytis* disease of lettuce.

Ann. appl. Biol., 1959, **47**: 685-97, bibl. 8.

Experiments were made during 1955-57 on the fungicidal control of *Botrytis* on May Queen lettuce, matured in frames from November to April, and on the Trocadero Improved variety, grown as seedlings in frames from November to March and then matured in the field from March to June. Treatments were applied only while the plants or seedlings were in the frames. On both types 0.33% thiram sprays applied on up to 5 occasions gave the best control of disease; 5% tecnazene dust was effective on the frame crop in 2 out of 3 years, both when applied to the plants and also when incorporated in the top soil at the rate of 15 g. per sq. yd. Tecnazene applications did not give good control of the disease on the field crop. Sprays of 0.25% captan were almost as effective as the thiram treatments on the field lettuce but not on the frame crop. [From authors' summary. See also *H.A.*, 29: 1506.]—*Nat. Veg. Res. Stat.*, Wellesbourne.

3848. WATKINSON, A.

***Botrytis* on lettuce. New compound saved £832 in one trial.**

Grower, 1960, **53**: 471-3.

A new compound R.D. 6584 (dichloronitroaniline), formulated as a 4% dust and called Allisan, has proved more active and persistent than any other materials available and also to have no adverse effects on growth. Pre-planting application, working it into the top 1 in. of soil is recommended, with post-planting application only if the crop is to remain in the ground for over 12 weeks. Pre-planting application increased germination by almost 70%. The cost of the material is 1-2% of the crop, and in one trial losses were reduced from 49.1 to 8.7% by its use.—Boots Pure Drug Co., Lenton, Nottingham.

3849. DUNN, J. A.

Black poplars shelter this pest.

Grower, 1960, **53**: 893-5, illus.

The lettuce root aphid (*Pemphigus bursarius*), which may also attack endive and chicory, passes the non-adult stages of its life history on Lombardy poplar. Thus, no further planting of this species should be made on horticultural holdings. However, black Italian, white and balsam poplars as well as aspen do not act as hosts of the aphid and could be used as windbreaks. Additional control can be obtained by practising adequate rotation, avoiding endive and chicory, and by keeping the land free of nipplewort and sowthistle. Summer lettuce should be directly sown since transplanted material succumbs more readily to the pest. Moist soil is less conducive to aphid attack than dry soil. Chemical control must aim at prevention

rather than cure. In trials at Wellesbourne Research Station 2 lb. of diazinon per acre gave 99% control; 1 gal. of 20% emulsifiable solution diluted to 30-50 gal. was sprayed on the soil surface and the soil rotavated to a depth of 3 in. The cost was £9 per acre, but application at rates below 2 lb. of diazinon per acre would probably give commercial control. The more resistant varieties available included White Favourite, Midas, Imperial E-4 and Iceberg.

3850. SHEAR, G. M.

Growing watercress.

Leaf. U.S. Dep. Agric. **448**, 1959, pp. 8, illus.

Suitable sites, the construction and management of beds including weed, disease and pest control, harvesting, and a note on growing for home use.

Mushrooms.

3851. CONROY, R. J.

The commercial mushroom industry in N.S.W.

J. Aust. Inst. agric. Sci., 1959, **25**: 176-83, bibl. 26, illus.

Growing is chiefly out of doors and is discussed under: historical, houses, spawn (now almost entirely locally produced pure culture grain spawn), diseases, competitors, insect and animal pests and economics.

3852. RASMUSSEN, C. R.

Pig manure compost as a culture medium for mushroom growing.

M.G.A. Bull., 1960, No. 121, pp. 12-14, 16-17, 21-22, 25-31.

A restatement and elaboration of the work reported in *H.A.*, 28: 3695. Yields using pig manure are now higher than those with horse manure.—Mushroom Res. Lab., Copenhagen.

3853. SCHAFFER, H. G.

Heavier, earlier mushroom yields with "through-spawning" techniques.

Comm. Gr., 1960, No. 3345, pp. 331-2, illus.

Trials over several years at the experimental farm of Messrs. W. Darlington and Son in Sussex have shown yields to be 25-30% higher with through-spawning than with conventional spawning, and the first pick is up to a week earlier. Larger quantities of spawn can be used. A spawning and casing machine, modified to take double sized trays is described briefly.

3854. TSCHIERPE, H.-J.

Die Bedeutung des Kohlendioxyds für den Kulturchampignon. (**The importance of CO₂ in mushroom cultivation.**) [English and French summaries $\frac{3}{4}$ p. each.] *Gartenbauwiss.*, 1959, **24**: 18-75, bibl. 81, illus.

A review of the relevant literature is followed by

a description of the author's own experiments at Berlin. Conclusions reached are as follows: CO₂ inhibits the growth of mushroom mycelium and this inhibition is largely independent of the oxygen present. There was no significant difference in growth as between 70% N + 30% O₂ and 95% N + 5% O₂. Regardless of the O₂ content 2% CO₂ caused a significant retardation of growth, and with 32% CO₂ there was no growth. The CO₂ content decreased during the development of sporophores both under commercial farm conditions and in culture boxes and laboratory trials. The CO₂ of the air in the compost increased with rise in temperature, after the application of the casing layer and immediately after the picking of a flush was completed. CO₂ had a morphological and physiological influence on developing sporophores. Concentrations of more than 11% CO₂ caused their death and normal sporophores developed only when the CO₂ concentration was less than 0.2%. Phenomena noted between these extremes are discussed. It was found that, if culture boxes were aerated with air artificially enriched with 0.5 and 1.0% CO₂, no sporophores developed but the mycelium grew through the casing and spread over its surface. It is postulated that the casing soil probably creates a CO₂ gradient from the air in the compost to the air above it and that fructification takes place in the region of this CO₂ partial pressure gradient.—Inst. Gemüseb., tech. Univ. Berlin.

3855. EGER, G.

Zum Problem der Fruchtkörperbildung beim Kulturchampignon (*Psalliota bispora* Lge.). (The formation of fruit bodies in the cultivated mushroom.)

Naturwissenschaften, 1959, 46: 498-9, bibl. 4.

Observations and experiments suggest that the presence of microorganisms is essential for the formation of fruit bodies in *Psalliota bispora*.

3856. BLAKE, C. D., AND CONROY, R. J.

Some nematodes as factors in yield reduction and spawn degeneration in the cultivated mushroom, *Agaricus hortensis* (Cke.) Imai.

J. Aust. Inst. agric. Sci., 1959, 25: 213-16, bibl. 6, illus.

In outdoor ridge beds in the Sydney area a high nematode population of more than 5,000 per 100 g. moist compost was found to be associated with a yield of less than 1 lb. of mushrooms per sq. ft., and a population of less than 500 with more than 1½ lb. per sq. ft. The commonest nematodes were *Rhabditis* spp. and *Ditylenchus myceliophagus*. Marked degeneration of mycelium in established rye grain mushroom cultures was caused by the introduction of either *Rhabditis* or *Ditylenchus* inoculum. Control by fumigation with 1 lb. of methyl bromide per 100 cu. ft. of compost just

before making the beds is recommended.—Dep. Agric., Sydney.

Okra.

3857. MILLER, J. C., JONES, L. G., AND WILSON, W. F., JR.

Gold Coast, a new variety of okra.

Circ. La agric. Exp. Stat. 57, 1959, pp. 4, illus.

A dwarf plant with a straight pod suitable for the local market or for processing.

3858. EDMOND, J. B., AND DRAPALA, W. J.

The effect of temperature, immersion in acetone, and sulfuric acid on germination of five varieties of okra seed.

Proc. Amer. Soc. hort. Sci., 1959, 74: 601-6, bibl. 3.

At a high temperature level (average 78.2° F.) the seed of all the varieties tested except Louisiana Green Velvet had completed germination within 28 days. At a low temperature level (average 68.8° F.) all except Emerald and Louisiana Green Velvet had germinated within this period. Soaking the seed in acetone for 20 or 40 min. had no effect on the rate of emergence or percentage germination of Clemson Spineless, Perkins Spineless, Emerald or Mississippi Spineless; it did, however, slightly increase both the rate of emergence and percentage germination of Louisiana Green Velvet. Immersion of the seed in concentrated sulphuric acid markedly increased the rate of emergence and the percentage germination of Louisiana Green Velvet, the effect increasing with increase of the immersion period from ½ hr. to 3 hr. With the other 4 varieties, which normally germinate more rapidly, the effects of immersion in sulphuric acid were not generally significant.—Miss. St. Univ., State College.

Onions.

(See also 3723.)

3859. MINISTRY OF AGRICULTURE, LONDON.

Onions.

Adv. Leaflet. Minist. Agric. Lond. 358, revised 1959, pp. 5.

Bulb, salad and pickling.

3860. PATIL, J. A.

Influence of time of planting on seed yield of onion (*Allium cepa* L.).

Poona agric. Coll. Mag., 1959, 50: 100-4, bibl. 2.

In 3 years' experiments with planting dates between 16 October and 4 December the 23-30 October proved the best time to plant onion sets for seed production. The number of seed heads and the percentage of flowers developing seeds did not vary with the planting date, but late planting significantly reduced the number of flowers per umbel.

3861. BRIEN, R. M., AND OTHERS.

Diseases and pests of onions in New Zealand and their control.

Inf. Ser. N.Z. Dep. sci. ind. Res. **24**, 1959, pp. 24, illus., 2s.

Fungous, bacterial, virus and non-parasitic (copper deficiency and scald) diseases, and thrips, maggot and leaf miners.

3862. SEGALL, R. H., AND NEWHALL, A. G.

Onion blast or leaf spotting by species of *Botrytis*.

Phytopathology, 1960, **50**: 76-82, bibl. 8, illus.

A disease on onions known as blast [previously considered to be caused by unfavourable environment] was found to be caused by several species of *Botrytis*, the commonest of which is *B. allii*. Spores germinating on the surface of onion leaves caused spotting typical of blast, if the plants were incubated in a humid atmosphere and received enough light. Shortly after appearance of the leaf-spotting phase the tips die back and the plants may die prematurely. There is no evidence of cuticular or stomatal penetration by the germinating spores, and hyphae were not found in the lesions. When the fungus was grown in nutrient broth plus dextrose, a toxin was produced capable of causing leaf spots indistinguishable from those induced by the germinating spores of *Botrytis*. The disease was controlled by spraying onions at weekly intervals with various protective fungicides, such as nabam, ferbam and captan, all of which significantly reduced the number of leaf spots caused by this *Botrytis* and subsequent blighting. [Authors' summary.]—Cornell Univ., Ithaca, N.Y.

3863. VAUGHAN, E. K.

Influence of growing, curing and storage practices on development of neck rot in onions.

From abstr. in *Phytopathology*, 1960, **50**: 87.

Excessive N fertilization and late irrigation resulted in increased incidence of neck rot [*Botrytis allii*] in Sweet Spanish onions of any given size, but the incidence of disease was proportional to the size of the onions. Curing on the ground for 3-4 days after undercutting but before topping helped to prevent neck rot, but the length of the curing period was not critical. Combinations of curing with the tops on and additional curing in the field after the tops had been removed were not better than corresponding periods of curing by either method alone. Drying for 24 hours in rapidly moving air at 95, 105 and 115° F. resulted in greatly reduced losses from neck rot. Higher temperatures or longer drying periods were injurious to the onions. In all cases more rot developed in onions stored in burlap bags than in onions stored in wooden crates.

3864. ALLEN, J. D., SMITH, H. C., AND HURNDALL, L. C.

Control of onion white rot by seed pelleting.

N.Z. J. Agric., 1959, **99**: 531-3, bibl. 4, illus.

In spite of some slight reduction in germination, onion seed pelleted with calomel at 1½ and 2 lb. per lb. gave significant yield increases over untreated seed. The recommended procedure is described.

3865. MCCLANAHAN, R. J., HARRIS, C. R., AND MILLER, L. A.

Resistance to aldrin, dieldrin, and heptachlor in the onion maggot, *Hylemya antiqua* (Meig), in Ontario.

A.R. ent. Soc. Ontario, 1958, 1959, **89**: 55-8, bibl. 4.

Resistant strains of the onion maggot were found in nearly all the major onion growing areas of Ontario.

3866. PERRON, J. P., AND LAFRANCE, J.

Control of the onion maggot, *Hylemya antiqua* (Meig.) (Diptera: Anthomyiidae), with insecticides in organic soils of southwestern Quebec.

Canad. J. Plant Sci., 1960, **40**: 156-9, bibl. 7.

Highly effective control of the maggot was obtained by mixing 1 oz. dieldrin, heptachlor or endrin wettable powders with 1 lb. of moistened seed prior to sowing. The heptachlor treatment appeared to stimulate plant growth. Di-syston as a seed treatment was effective but reduced germination by one-third. Toxaphene, also as a seed treatment, gave poor control. A soil surface treatment of 4.5 lb. chlordane dust per acre gave fair control where the seed had not been treated. Combinations of dieldrin or DDT seed treatments with chlordane or aldrin soil surface treatments were not more effective than seed treatment alone. [From authors' abstract.]—Canada Dep. Agric., St. Jean, Quebec.

3867. CARDEN, P. W.

The control of onion fly, *Delia antiqua* (Mg.), with seed dressings.

Bull. ent. Res., 1960, **50**: 795-807, bibl. 13, illus.

Seed treatments of calomel, DDT, dieldrin and aldrin were compared in three seasons' field trials for use against onion fly, *Delia antiqua* (Mg.). Excellent control and also improved germination were obtained with 0.5 oz. actual dieldrin per lb. of seed, applied with a sticker, with or without thiram. Similar results were obtained with 0.1 and 1.5 oz. actual dieldrin per lb. of seed, but 3.2 oz. reduced germination. Aldrin at the same rates gave excellent control but reduced germination. DDT at 1.5 oz. and 3.2 oz. gave good control early in the season, but was not sufficiently persistent and seriously reduced germination.

Calomel gave little control, although it improved germination. Although kerosene used as a sticker for a dust was satisfactory, it was liable to reduce germination seriously when used alone, except at very low rates. Seed treated with DDT, dieldrin or aldrin may be stored safely for a month or two in unsealed containers but not in sealed containers. There was close correlation between the percentage of plants attacked and the yield per 100 plants in the original stand. For every 10% of plants killed by onion fly there was a 10% loss of the potential yield. Even where the onion-fly attack was heavy, comparatively few plants showed symptoms of damage at any one time, which suggests that the level of attack is frequently under-estimated. [Author's summary.]—Minist. Agric., Anstey Hall, Trumpington, Cambridge.

3868. MACLAGAN, D. S.

Bionomics of onion fly and its control by seed dressings.

Scot. Agric., 1960, 39: 201-4, bibl. 3.

Losses due to *Delia antiqua* attack may amount to 90% of the crop in plague years. Recent field trials have shown a seed dressing of $\frac{1}{4}$ oz. pure dieldrin plus $\frac{1}{2}$ oz. 50% thiram per lb. of seed to give excellent protection. Thiram, although valueless alone, greatly enhanced the protective action of dieldrin. [From author's summary.]—W. Scot. agric. Coll., Glasgow.

3869. WILLIAMS, E. A.

Harvesting and marketing onions.

Agriculture, Lond., 1960, 66: 554-6, illus.

Including advice on storage and grading.

3870. OGATA, K., IWATA, T., AND CHACHIN, K.

The effect of gamma radiation on sprout prevention and the physiological mechanism of the onion bulb. [Japanese, with English summary $\frac{1}{2}$ p.]

J. hort. Ass. Japan, 1959, 28: 143-8, bibl. 11, illus.

Onion bulbs were irradiated with 3,000, 7,000 and 12,000 r. after harvesting on June 28 and also at the pre-sprouting period when dormancy ended on Sept. 20. Sprouting was completely inhibited even by 7,000 r. and the storage period was extended by 4-5 months. The inner buds on irradiated bulbs were brown and dead but outer buds were not. September-irradiated bulbs exhibited larger brown areas suggesting that elongation and/or differentiation occurred during storage; hence early irradiation would be preferable. Oxygen uptake in the disk part was not directly influenced by irradiation, but the normal increase in respiratory activity after the pre-sprouting period was suppressed. The sugar and ascorbic acid contents were not immediately affected by radiation, but once sprouting had started the non-reducing sugar content did not decline as in untreated bulbs.

Irradiation had no effect on flavour, and there were no significant differences in the concentrations of growth promoting and inhibiting substances in the inner buds of irradiated and control bulbs. [See also *H.A.*, 29: 478.]

3871. GOLINS'KA, E. L., AND KARNAUHOVA, L. A.
A study on the greening of onion (*Allium cepa* L.) bulbs. [Ukrainian, with English and Russian summaries $\frac{1}{2}$ p. each.]

J. Bot. Acad. Sci. Ukr., 1959, 26(2): 14-24, bibl. 17, illus.

It is shown that the green plastids formed in the undifferentiated cytoplasm of onion scales contain not chlorophyll but certain other pigments that may be related to the flavones.

3872. SINHA, A.

Chemical examination of *Allium cepa* L. I. Glycosidic and sugar fractions.

Indian J. appl. Chem., 1959, 22: 89-91, from abstr. in *J. Sci. Food Agric.*, 1960, 11: i-146.

Oleanolic acid has been detected in the glycoside fraction. The soluble carbohydrate fraction comprises arabinose, rhamnose, xylose and ribose.

Root crops.

(See also 3130, 3158, 3695, 3723, 3728, 3734, 3747-3751, 3763, 4309.)

3873. GORBUŠINA, N. M.

Spacing of red beet grown with a paper mulch in soils of different fertility and with different numbers of plants in each hole. [Russian.]

Izv. Timirjazev. sel'sk. Akad., 1959, No. 6, pp. 217-23.

Paper mulching increased yields at all spacings tested, the increases being greater the closer the spacing. With mulched plants growing in a rich soil the largest yields were obtained when plants were spaced 45 cm. $\times$ 8 cm. with 3 plants in each hole. To obtain the highest yields per hectare spacing should be closer on a rich soil than on a poorer one. On a rich soil an initial flush of foliage development was followed by rapid swelling of the root, whereas on a poor soil there were parallel increases in the weight of foliage and roots. The percentage of soluble solids in the roots decreased with increased spacing and increased with age of plant.

3874. CARLSSON, G.

Försök med olika stammar av morotsorten Amsterdamer i jämförelse med Amsterdamer OJO/54. (Trials of different strains of the carrot variety Amsterdam in comparison with Amsterdam OJO/54.) [English summary $\frac{1}{2}$ p.]

Meddel. Gulläk. VäxtförädlAnst., Hammenhög, 1959, No. 15, pp. 98-116, bibl. 4, illus.

Among 49 strains 7 different types of Amsterdam were distinguished.

3875. CHIPMAN, E. W.

The influence of length of growing season on root type of carrot varieties.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 583-6, bibl. 5.

Five varieties of long-rooted carrot were grown on a sandy loam soil and harvested at 106, 130 and 159 days after sowing. Yields, root length, root diameter and percentage of cracked roots all increased with length of time to harvest. The degree of forking was not increased by late harvesting. The highest proportion of the best grade roots (of the long, slender, tapering type) was obtained at the first harvest. Gold Pak and Gold Spike did not show large yield increases from delayed harvesting and should therefore be harvested at the earliest date to reduce loss from cracking. The yield of Long Nantes increased rapidly up to the time of the second harvest, after which the increase was slow; the second harvesting date is therefore recommended. Long Emperor and Imperida showed a constant increase in yield up to the last harvesting date.—Exp. Fms Serv., Canada Dep. Agric.

3876. SEINHORST, J. W., AND RIEZEBOS, D.

Proeven over de bestrijding van staartpeen. (Trials on the control of "staartpeen" (tailed carrot) disease.) [English summary $\frac{1}{3}$ p.] *Meded. Dir. Tuinb.*, 1959, **22**: 620-5, bibl. 1, illus.

Carrot roots affected by "staartpeen", the cause of which is not known, remain short and conical, with the lower part of the root becoming thickened, grey in colour and covered with calluses. Calluses and skin cracking also occur on the irregularly shaped upper part of the taproot. Soil treatments in the spring with DD (50 ml./sq. m.) greatly reduced the disease in carrots sown shortly afterwards, but in some cases a severe attack occurred in the treated plots when a second crop was sown immediately after the first. Late summer treatment of the soil resulted in serious damage to winter and early spring grown carrots. The similarity of this damage to that caused by the disease made it impossible to decide if late summer treatment with DD exerted any control. No control in winter sown carrots was achieved with Vapam at up to 50 ml./sq. m.

3877. SCOTT, H. E.

The effect of planting dates on infestation of the carrot rust fly (*Psila rosae* F., Psilidae: Diptera).

J. Elisha Mitchell Sci. Soc., 1959, **75**: 148-50, from *Biol. Abstr.*, Sect. D, 1960, **35**, Abstr. 11,528.

All carrots planted at weekly intervals between

May 16 and July 18, 1952, were infested to a similar degree. However, those planted after June 6 gave decreased yields, and those planted after June 27 were almost entirely unmarketable.—N.C. St. Coll., Raleigh.

3878. SCOTT, H. E.

Varietal responses of carrots to carrot rust fly (*Psila rosae* F., Diptera: Psilidae).

J. Elisha Mitchell Sci. Soc., 1959, **75**: 151-3, from *Biol. Abstr.*, Sect. D, 1960, **35**, Abstr. 11,529.

All 6 varieties tested were subjected to attack. However, varieties of the Nantes-type were most susceptible, Danvers and Chantenay intermediate, and Emperor was least susceptible.—N.C. St. Coll., Raleigh.

3879. VAN'T SANT, L. E.

Neuere Ergebnisse bei der Bekämpfung der Möhrenfliege (*Psila rosae* F.) in den Niederlanden. (Recent results obtained in the control of the carrot fly in the Netherlands.) Reprinted from *Verhandl. IV. int. PflSch.-Kongr. Hamburg*, 1957, 1959, Vol. 1, pp. 705-6.

With the exception of experiments carried out with winter carrots under unusual conditions, seed treatment with aldrin or dieldrin reduced the incidence of carrot fly very satisfactorily. The flavour of the crop did not suffer, nor was there any toxic hazard to the consumer. In general, germination of the treated seed was normal.—Inst. PlZiekt. Onderz., Wageningen.

3880. (WRIGHT, D. W.)

Recommendations for dieldrin [to combat carrot fly].

Comm. Gr., 1960, No. 3354, p. 928.

On peat soils a first treatment of 8 pints of 15% dieldrin per acre and on mineral soils 4 pints per acre mixed or rotavated into the top 3-4 in. of soil is recommended. Where dieldrin has been applied the previous year only 2 pints should be given on both soil types. [For an earlier report, see *H.A.*, 29: 1494.]—Nat. Veg. Res. Stat., Wellesbourne.

3881. EGIJAROV, G. M.

Radiosynthesis of C and B vitamins in some foods. [Russian.]

Doklady Akad. Nauk S.S.S.R., 1959, **128**: 1070-72, bibl. 6.

Exposing carrots to 50,000 r. γ rays after harvesting increased their vitamin C content, but further exposure to 1,000,000 r. caused a sharp reduction in the vitamin content.

3882. KOŠTÍŘ, J., AND PETRŮ, E.

Die Anthocyane der Möhre. (The anthocyanins of carrots.)

Naturwissenschaften, 1957, **44**: 514, bibl. 11.

In flowers and roots.

3883. CARLSSON, G.

Nya stammar av vinterdrivrädisa: Amager oval vinter OJO/54, Rubin vinter OJO/54, Saxa vinter OJO/54. (New strains of winter forcing radishes: Amager Oval Winter OJO/54, Rubin Winter OJO/54 and Saxa Winter OJO/54.) [English summary 9 lines.] Meddel. Gullåk. VäxtförädlAnst., Hammenhög, 1959, No. 15, pp. 119-23, bibl. 3, illus.

Which develop normally in 6-8-hour days with low light intensity.

3884. CARLSSON, G.

Correlation between seed size, cotyledon size and earliness, and between seed size and *Alternaria* attacks in radish varieties for forcing. Their use in plant breeding and their practical significance. [Swedish summary ½ p.]

Meddel. Gullåk. VäxtförädlAnst., Hammenhög, 1959, No. 15, pp. 144-59, bibl. 6, illus.

A significant correlation was obtained between the size of the seeds and of the cotyledons. Large seeds produce large cotyledons and small seeds small cotyledons. A significant correlation was obtained between the size of the cotyledons and earliness. The larger the cotyledons, the larger was the percentage of roots that were mature at the first harvest; hence large seeds produced an earlier crop. A weak correlation was found between seed size and increased *Alternaria* infection. Threshing the seeds when their water content was high increased the damage suffered by the large seeds and encouraged *Alternaria* infection.

3885. CARLSSON, G.

Cytoplasmic-inherited chlorophyll defects in radishes and their influence on earliness. [Swedish summary 5 lines.]

Meddel. Gullåk. VäxtförädlAnst., Hammenhög, 1959, No. 15, pp. 165-8, bibl. 6, illus.

Chlorophyll defects in radishes were found to be caused by the presence of white plastids in the cytoplasm. In winter the development of the crop was delayed in the greenhouse, but from May onwards, when light conditions were good, the trouble ceased to be important. It should be possible to overcome the defect by selection.

3886. POSTA, A.

Influence exercée par trois températures différentes sur l'activité prolifératrice et l'élongation des racines d'orge et de radis. (Effects of three temperatures on proliferation and elongation of roots of barley and of radish.)

Rev. Cytol. Biol. vég., 1958, 19: 345-76, from Biol. Abstr., Sect. D, 1960, 35, Abstr. 17,024.

Seeds were germinated and seedlings grown at constant temperatures of 22°, 12° and 2° C. and

their roots studied. Of the 3 temperatures 22° C. provided very rapid initial growth, and the proportion of cells in mitosis reached a maximum at about 4 days and then diminished rapidly. At 12° the maximum, though not reached until about 9 days, was maintained thereafter throughout the 26-day study. At 2° mitosis did not begin until about the 9th day but was maintained at a constant percentage thereafter. A temperature of 12° was thus more favourable than either of the others. Mitoses, once initiated, were entirely normal at all 3 temperatures.

3887. LUCAS, M. D., AND DE FREITAS, F. C.

Ensaio de adubação num solo pardo do Alentejo. (Cultura em vasos pequenos.) (Fertilizer trials with a grey Alentejo soil, using small pots.) [English summary ½ p.] Agron. lusit., 1958, 20: 295-309, bibl. 4.

Radishes were used as the test crop in fertilizer trials with N, P, K, Ca and combinations of these nutrients. There were highly significant responses to N, P and NP, but K had little or no effect. In the presence of N, the response to Ca was appreciable, otherwise it was positive but not significant.

3888. LI, Š.-D.

The influence of the quantity of pollen placed on the stigma on the quantity and quality of the seeds produced and their progeny. [Russian, with English summary 9 lines.] Izv. Timirjazev. sel'sk. Akad., 1959, No. 6, pp. 224-7, bibl. 11.

Pollination of radishes with different quantities of pollen affected the number of seed pods and the number of seeds per pod. Larger quantities of pollen produced more pods per plant and more seeds per pod. The progeny from pollination with small quantities of pollen grew more slowly and produced smaller roots than when larger quantities of pollen were used.

Spinach.

(See also 3125, 3127, 3133.)

3889. WESTGATE, P. J., AND FORBES, R. B.

Improvement on cultural practices for cabbage, lettuce, celery and other vegetable crops. A.R. Fla agric. Exp. Stats, 1957-58, pp. 187-8.

When 3 levels each of N, P and K were tested in all possible combinations on spinach grown in peat, N produced the largest yield increases followed by K and P. In a trial on N sources for spinach on peat nitrate of soda plots significantly (19 : 1) outyielded Uran and ammonium sulphate plots in a cold, wet season. Of 6 different forms of Fe, Zn and Mn applied to squash an EDTA compound gave the best foliage colour, with TPS (triphenyl sulphonium chloride) second.

3890. NETTLES, V. F., AND THOMPSON, B. D.
Value of gibberellins in the improvement of production and quality of vegetable crops.
A.R. Fla agric. Exp. Stats, 1957-58, p. 172.

Potassium gibberellate at 10 p.p.m. applied to well-established spinach plants increased petiole diameter within 6 days after treatment. Leaf length was also increased in some cases and the leaves became more erect. The autumn yields of southern [cow] peas were increased by a single spray of gibberellins at 15 p.p.m. The treatment applied to other crops was either ineffective or detrimental.

3891. GOODE, M. J., AND READING, G. D.
A non-parasitic disease of spinach.
Ark. Fm Res., 1959, 8(5): 8, illus.

Stunting, chlorosis and die-back occurred on several soil types with different drainage conditions. The disorder was found to be non-pathogenic, and samples of soil from affected areas produced healthy crops if lime was added to raise the pH from 5.8 to 7.0. These results have not yet been reproduced under field conditions.

3892. BASU, D. K., AND BURMA, D. P.
Purification and properties of a stereospecific dihydrolipoic dehydrogenase from *Spinacia oleracea*.
J. biol. Chem., 1960, 235: 509-13, bibl. 25.

Sweet and red peppers and eggplants.

(See also 3932, 3933, 4621.)

3893. ELENKOV, E.
On the relationship between sweet pepper varieties and *Verticillium* wilt. [Bulgarian.]
Bull. Plant. Prot., Sofia, 1957, 6(1): 32-7, bibl. 1.

Inoculation tests of 115 varieties of sweet and hot pepper with *V. albo-atrum* showed that the local hybrid Mariza 786, California Wonder Strain 1005, Sivria and Gorolynt (used for paprika production) were completely resistant to the disease.

3894. VÁGNEROVÁ, V.
 Příspěvek ke studiu předosevní přípravy papriky roční (*Capsicum annuum* L.). (A contribution to the study of pre-sowing treatments of red pepper (*C. annuum*).) [Russian and German summaries $\frac{1}{2}$ p. each.]
Acta Univ. Agric. Silv. Brno, Ser. A, 1959, No. 4, pp. 515-28, bibl. 14.

The most satisfactory treatment for the variety Hodoninská Zelená was keeping the seed at a constant temperature of 22° C. for 5 to 10 days. This method advanced germination by 7 to 16 days and stimulated growth and branching, which resulted in an increased number of flowers and

fruits. Flowering was advanced by 3 to 11 days, the difference being smaller in a hot summer.

3895. PUTTARUDRIAH, M.
A short review on the chilli leaf-curl complex and spray programme for its control.
Mysore agric. J., 1959, 34: 93-5.

Curling of leaf-margins may be caused by thrips or mites or by several viruses carried by 2 species of aphid or 2 species of white fly. Parathion, endrin and 50% BHC w.p. are all effective. A spray programme of parathion plus wettable sulphur for mildew control is suggested.

3896. MATTA, A.
 Attacchi di *Botrytis cinerea* su peperone. (*Botrytis* stem rot of capsicums.)
Riv. Ortoflorofruttic. ital., 1959, 43: 565-7, bibl. 5, illus.

Preventive spraying with TMTD or captan and a curative application of 5% pentachloronitrobenzene dust to the lesions gave fairly satisfactory results.—Ist. Pat. veg., Univ. Studi Torino.

3897. HRISTOVA, E.
Anthracoze, a new disease of sweet peppers. [Bulgarian.]
Ovoštarstvo i Gradinarstvo, 1958, No. 2, pp. 46-7, illus.

Anthracoze caused by *Colletotrichum nigrum* [*Glomerella cingulata*] has been recorded on capsicums for the first time in Bulgaria, and the disease is spreading alarmingly in some parts of the country. Bordeaux mixture at 1% can be used for control but may be phytotoxic to some varieties.

3898. PRATT, H. K., AND LYONS, J. M.
Respiration and ripening of fruits of bell pepper (*Capsicum annuum* L.).
 From abstr. reprinted from *Proc. IX. int. bot. Congr.*, 1959, Vol. 2, pp. 308-9.

In bell pepper fruits the rate of CO₂ production and the pattern of colour changes during ripening are similar to those of tomato, but unlike the tomato no climacteric curve of respiration was obtained.—Univ. Calif.

3899. MOCHIZUKI, T.
The carbon metabolism of eggplants as affected by bearing fruits. [Japanese, with English summary 7 lines.]
Bull. Fac. Agric. Hirosaki Univ., 1959, No. 5, pp. 28-31, bibl. 5, illus.

Experiments with C¹⁴ showed that the poor root development observed in fruit-bearing eggplants was due to slower movement of assimilated C¹⁴ to the roots. Poor root development in turn caused decreased assimilation efficiency in the foliage, leading to decreased vigour compared with that of deblossomed plants.

Tomatoes—general.

(See also 3725, 4598, 4625.)

3900. MINISTRY OF AGRICULTURE, LONDON.

Tomatoes.*Bull. Minist. Agric. Lond.* 77, 5th edition, 1959, pp. 74, illus., 5s. 6d.

As might be expected with such an important crop, on which research is continuous, some sections of this new edition have been rewritten [for 4th edition see *H.A.*, 27: 2493] and a brief new one on the plant has been added. The subject matter has been slightly rearranged, varieties being given a separate section. Information on methods of propagation and crop management has been amended, and the section on marketing has been expanded to include notes on ripening and storage.

3901. MCFERRAN, J., AND VAN WANN, E.

Growing tomatoes in plastic greenhouses.*Ark. Fm Res.*, 1959, 8(5): 4, illus.

The construction and heating arrangements of a panel-type house, using 2 layers of clear vinyl plastic, are described. Cultural methods are outlined. Eight varieties were tested, of which Tuckcross M was the latest and Tuckcross V the earliest; the former also yielded best.

3902. MITCHELL, A. P.

Vary the height of tomato wires.*Grower*, 1960, 53: 405-6.

A work study has shown that: (1) the variety Baby Lea requires less training and de-leafing than Potentate, Bonne Chose or Moneymaker; (2) arch training entails less work than lateral training; (3) wire heights should be varied between 6 and 7 ft. where possible, since this allows more flexibility at the critical training period when the plant has passed the top wire; and (4) only ties which are absolutely essential for support and guidance should be made.—Plant Protection Ltd., Fernhurst.

Tomatoes—breeding and varieties.

(See also 3176.)

3903. FIRBAS, H.

Betrachtungen zum Problem der Frostresistenzzüchtung von Tomaten. (**Observations on the problem of breeding tomatoes for frost resistance.**)

Züchter, 1960, 30: 1-2, bibl. 6.

Which can probably only be achieved by crossing with resistant wild species, such as *Lycopersicon peruvianum* or *L. hirsutum*.

3904. WILLIAMS, W., AND GILBERT, N.

Heterosis and the inheritance of yield in the tomato.*Heredity*, 1960, 14: 133-49, bibl. 14.See also *H.A.*, 30: 761.

3905. GEORGIEVA, R., DIMITROVA, E., AND GEORGIEV, D.

Influence de certains facteurs physiques sur le caractère de l'hérédité dans l'hybridation des tomates. II. Influence des ultrasons. (**The influence of certain physical factors on the character of heredity in the hybridization of tomatoes. II. The influence of ultrasonics.**) [Russian summary 9 lines.]

C.R. Acad. bulg. Sci., 1959, 12: 467-70, bibl. 7, illus.

Ultrasonic treatment of the pollen of *Lycopersicon pimpinellifolium* materially affected the hybrid progeny of this species crossed with tomatoes. Fruit size was increased, but dry matter, sugar and vitamin C contents were reduced. [For part I, see *H.A.*, 29: 2546.]

3906. KUZDOWICZ, A.

Das Problem der Fertilität und der Ertragsfähigkeit von Autotetraploiden der Gattung *Lycopersicon* Mill. (**The problem of fertility and yields in autotetraploids of the genus *Lycopersicon*.**)

Züchter, 1960, 30: 6-11, bibl. 8, illus.

Studies on tetraploids, produced by colchicine treatment, of 4 tomato varieties and of wild and primitive tomato forms, as well as of hybrids between tetraploid tomato varieties and tetraploids of the primitive forms, led to the following, among other, conclusions: (1) In all cases tetraploidy was associated with an increase in the size of both the vegetative and generative organs, and especially of the leaves and stems. In tetraploid varieties the growing period was considerably prolonged, which made them late fruiting. Their yields were low as the result of reductions both in fruit size and fruit set. With tetraploids of the wild forms these tendencies were less marked. (2) Fertility in tetraploids was reduced to about 50% in the wild forms and to 13-32% in the varieties by comparison with that of diploids. (3) The crossing of tetraploid wild and primitive forms with tetraploid varieties, however, offers good prospects of breeding economically valuable tetraploid tomatoes with new characters.—Inst. Zücht. Akklim. Pfl., Bydgoszcz (Poland).

3907. JENKINS, J. M., JR.

Which tomato variety?*Res. and Fmg N.C.*, 1959, 18(1): 14.

Among varieties tested Rutgers and Homestead 24 were best; among new hybrids Big Boy was outstanding, followed by Moreton Hybrid.

3908. MOORE, E. L.

Tomato variety test results at State College.*Miss. Fm Res.*, 1959, 22(12): 3.

Kokomo and Big Boy heaviest croppers over 5 years; Early Delicious, a new hybrid, very promising in its first year.

3909. MILLER, J. C., HERNANDEZ, T. P., AND TIMS, E. C.
Red Global, a new disease- and heat-resistant tomato.
Circ. La agric. Exp. Stat. **60**, 1959, pp. 3, illus.

This variety will set fruit under higher temperatures than most varieties, is resistant to *Fusarium* wilt and foliage diseases, and gives high but not very early yields.

3910. MALIANI, C.
Il pomodoro Gimar, idoneo anche per pelati. (The tomato variety Gimar, ideal for canning, as well as for direct consumption.)
Ital. agric., 1960, **97**: 232-4, illus.

This variety was derived from multiple interspecific crossing, 2 of its ancestors being *Lycopersicum pimpinellifolium* and *L. peruvianum*. The fruit has a transparent yellowish skin and bright red pulp, is very firm and not easily damaged by hail. Its composition makes it very suitable for processing, and one of the main advantages of the variety is its high resistance to leaf infections.

Tomatoes—environment and nutrition.

(See also 3114, 3122, 3714, 3921, 3944.)

3911. FRÖHLICH, H.
Untersuchung über die Wirkung einer Bodenheizung bei der frühen Haustomatenkultur. (Studies on the effect of soil heating in growing early glasshouse tomatoes.)
Arch. Gartenb., 1959, **7**: 547-54, bibl. 4, illus.

No significant increases in yield or earliness were obtained from heating the soil with steam to 15–18° C. or 20–22° C. from January to early May. In earlier trials soil heating from January to April reduced yield and quality [see *H.A.*, 28: 2674].—*Inst. Gartenb. Grossbeeren*.

3912. ABD EL RAHMAN, A. A., AND BIERHUIZEN, J. F.
The effect of temperature and water supply on growth, transpiration and water requirement of tomato under controlled conditions.
Meded. LandbHoges. Wageningen, 1959, **59**(3): 1-13, bibl. 7, illus.

Tomato plants were kept at different air temperatures (26°, 20°, 15° and 10° C.) and given 4 different irrigation treatments under artificial illumination. The decrease in the transpiration rate with decreases in temperature and in vapour pressure deficit was less pronounced at lower irrigation levels than at higher levels. With optimum conditions of temperature and water supply the transpiration rate was double that of soil evaporation, but under adverse conditions the soil evaporation exceeded transpiration. Fresh and dry weights of the experimental plants were both reduced by lower tem-

perature and irrigation levels. The water requirement, i.e. g. water per g. dry weight, decreased with air temperature and water supply.

3913. ABD EL RAHMAN, A. A., BIERHUIZEN, J. F., AND KUIPER, P. J. C.
Growth and transpiration of tomato in relation to night temperature under controlled conditions.
Meded. LandbHoges. Wageningen, 1959, **59**(4): 1-6, bibl. 6, illus.

Tomato plants grown for 28 days at a constant day temperature of 25.3° C. for 12 in every 24 hours were divided into 4 groups that were provided with night temperatures of 25.3° C., 20.0° C., 15.6° C. and 9.2° C., respectively. Lower night temperature reduced stem length, dry weight per sq. cm. of leaf and total dry matter of shoots. The water requirement, i.e. g. water per g. dry matter, did not show any regular variation in relation to night temperature.

3914. LEDBETTER, M. C., MAVRODINEANU, R., AND WEISS, A. J.
Distribution studies of radioactive fluorine-18 and stable fluorine-19 in tomato plants.
Contr. Boyce Thompson Inst., 1960, **20**: 331-48, bibl. 23, illus.

A study was made of the distribution and sites of accumulation of fluorine in tomato plants, using NaF¹⁸, HF¹⁸, NaF¹⁹ and HF¹⁹ applied through the roots and cut vascular systems and in gaseous forms to the aerial parts. Fluorine, applied as NaF¹⁹, accumulated, in decreasing order of concentration, in the roots, lower leaves, upper leaves and stems. When HF¹⁸ was supplied, the major concentrations appeared at the tips and margins of the leaflets and in the stem glands. Prolonged exposure to HF¹⁹ resulted in the leaves accumulating fluorine in the cell walls, chloroplasts, soluble proteins, mitochondria and microsomes in that order, whereas with short-term exposure to HF¹⁸ the order was soluble proteins, chloroplasts, cell walls and mitochondria. Little or no fluorine was found in the pigments or lipids of the chloroplasts.

3915. BURDINE, H. W., RAY, H. E., AND HAYSLIP, N. C.
Nutritional sprays for vegetable crop production.
A.R. Fla agric. Exp. Stats, 1957-58, pp. 277 and 296.

"Hollow pod" incidence in beans was increased by Zn and Cu sprays but was not affected by Mo and B sprays. Urea sprays applied to supplement soil applications of N to autumn-grown unstaked tomatoes resulted in yields comparable to those obtained when all the nitrogen was applied in the solid form as ammonium nitrate.

3916. CANNELL, G. H., BINGHAM, F. T., AND GARBER, M. J.

Effects of irrigation and phosphorus on vegetative growth and nutrient composition of tomato leaves.

Soil Sci., 1960, **89**: 53-60, bibl. 20.

Pot experiments were carried out with an acid loamy sand, a slightly acid silt loam and an alkaline sandy loam soil, each adjusted to 4 levels of P (from high to excessive). The differential moisture treatments, begun when the tomato plants were 3 weeks old, consisted in irrigating when the soil moisture reached 0.2, 0.6 and 5 bars suction [1 bar = 10^6 dynes/sq. cm.]. In the 1st soil increasing the moisture tension resulted in lower dry weight totals and a greater concentration of Ca, Mg, K, N, P, Mn, Zn and Mo in the leaves. The elements similarly affected in the 2nd soil were Ca, Mg, Na, K, P, N and Mn, and the total dry weight was higher with the 0.2 bar treatment than with the other moisture regimes. The 3rd soil produced plants of poor growth, with severe die-back of the leaves, except in the driest treatment. Increased soil moisture tension in this case led to an increase in foliar Na, K, Fe and Mn and a decrease in foliar Cu and Mo. The plants grown at low moisture tension in this soil were chlorotic. Plant growth in all 3 soils responded to P, and in the 3rd soil P decreased the adverse effects of low soil moisture tension on growth. The effects of P on leaf composition were: 1st soil—increased Ca, Mg, P, N, Mo and possibly Mn, and decreased Na, K, B, Cu and Zn; 2nd soil—increased Mg, P, Mn and Mo, and decreased Ca, K, B, Cu and Zn; 3rd soil—increased P and Mn, and decreased Mo and Zn.—Univ. Calif., Riverside.

3917. LOCASCIO, S. J.

Effect of phosphate placement and soil temperature on phosphorus absorption and growth of tomatoes.

Diss. Abstr., 1959, **20**: 1521, being *L.C. Card No. Mic.* 59-4162, of 97 pp.

Observations on field-seeded tomatoes indicate that purpling, characteristic of P deficiency, often occurs, and that seedling growth may be retarded despite the banding of fertilizer a few inches from the seeds. Greenhouse studies using P³² have shown that it takes 28 to 31 days for P to be absorbed from placements 1-2 in. to the side and 2.5 in. below the seed. Mono-potassium or mono-ammonium phosphates applied directly on the seeds greatly increased the P concentration in the rhizosphere and at 5 lb. of P per acre resulted in good P uptake and growth. Placement of 30 lb. of P per acre 1.5 in. below the seed was far better than placing the same amount at other distances. In the field near-maximum yields were obtained without band fertilization when a seed application was used. Growth and P absorption were much

less at a soil temperature of 55° than at 70 or 85° F. A linear growth increment was noted with increased rates of P at 55° F., but at the two higher temperatures growth approached the maximum with the first increment of P.—Purdue Univ.

3918. MAYNARD, D. N., GERSTEN, B., AND MICHELSON, L. F.

The effects of boron nutrition on the occurrence of certain tomato fruit disorders.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 500-5, bibl. 19.

Evidence is presented that open locule, russetting and internal browning of tomato fruits are all manifestations of B deficiency. Open locule occurs as a result of the rupture of thin-walled collenchyma cells caused by B deficiency in immature fruit. Russetting results from the rupture of such cells if the B deficiency occurs when the fruit is approaching maturity. Internal browning is thought to be associated with a sugar deficiency in the developing fruit. A deficiency of B, which results in reduced sugar movement, is shown to be one of the factors responsible for the development of internal browning symptoms.—Univ. Mass., Amherst.

3919. GERLOFF, G. C., STOUT, P. R., AND JONES, L. H. P.

Molybdenum-manganese-iron antagonisms in the nutrition of tomato plants.

Plant Physiol., 1959, **34**: 608-13, bibl. 17.

In contrast to results reported elsewhere Mo accentuated Fe chlorosis induced in tomatoes by excess concentrations of Mn in the nutrient medium. Tissue contents of Fe, Mn and Mo were correlated closely with visual observations and growth data, the Fe content decreasing with increasing concentrations of either Mn or Mo in the external medium. As little as 0.67 p.p.m. of Mo added to the medium induced Fe chlorosis and reduced growth. The results also showed that high Fe concentrations may accentuate Mo deficiency. It is suggested that an Fe-Mo precipitate of low solubility forms in the roots, which makes Fe unavailable to the tops.—Univ. Calif., Berkeley.

Tomatoes—growth and physiology.

(See also 3147, 3912, 3913, 3940.)

3920. HUDSON, J. P.

Relations between root and shoot growth in tomatoes.

Sci. Hort., 1960, **14**: 49-54, bibl. 13.

Possible methods of measuring the efficiency of a root system are discussed, which could be used in assessing root/shoot relationships. It is pointed out that, in the special case of the glasshouse tomato, roots are not needed for anchorage or for obtaining water from the deeper layers of the soil, so that a management system which induces

a minimum of root may be ideal.—Univ. Nottingham, Sutton Bonington.

3921. LOCASCIO, S. J., AND WARREN, G. F.
Growth pattern of the roots of tomato seedlings.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 494-9, bibl. 8, illus.

A greenhouse experiment was conducted to investigate the growth pattern of tomato roots, as determined by specific placements of radioactive P and by washing out and observing the root system every two days from the 10th to the 24th day after planting. The initial root growth was of the tap-root type, penetrating about an inch deep by the time the cotyledons emerged. The growth after this relatively shallow penetration was as rapid laterally as vertically. On the soil to which only tracer P was added plant growth was related to the time required for the roots to reach the radioactive P. [From authors' summary.]—Purdue Univ., Lafayette, Ind.

3922. ISSAKO, L.
Sortidevahelise pookimise tulemusi tomatil. (Results of intervarietal grafting of tomatoes.) [Russian and German summaries $\frac{3}{4}$ p. each.] *Izv. Akad. Nauk EstSSR, Ser. biol.*, 1960, No. 1, pp. 47-59, bibl. 14.

A study was made of the influence of the rootstock on the scion and its seed progeny after a single and repeated grafting, using 4 varieties in paired reciprocal combinations. No morphological changes appeared. Segregation continued up to the 5th and last generation studied, and certain new characters arose. Morphological change was associated with biochemical differences, the average contents of dry matter, monosaccharides and vitamin C varying more widely than in the controls. A statistical examination of the results showed that differences in the composition of the morphologically unaffected fruits and leaves of the experimental plants and those of the controls were not significant. Repeated grafting exerted no greater influence than single grafting.

3923. HEINZE, W.
Über den Einfluss des Blattes auf den Blühtermin bei der Tomate. (On the influence of the leaf on the date of flowering in tomatoes.)

Naturwissenschaften, 1959, **46**: 609, bibl. 2.

In early tomato varieties the difference in the date of flowering between defoliated and control plants was small, but in late varieties the presence of leaves caused a considerable delay in flowering. From this it is concluded that in tomatoes the varietal date of flowering is largely determined by the physiological specificity of the leaf.—Humboldt-Univ., Berlin.

3924. BRUBAKER, K. K.
Effects of several patterns of defoliation on fruit production of the tomato plant (*Lycopersicon esculentum* Mill.) with reference to possible paths of carbohydrate movement from leaves to fruit.
Diss. Abstr., 1959, **20**: 1940, being *L.C. Card No. Mic.* 59-5882 of 103 pp.

The effects were studied of varying the number and position of leaves removed from tomato plants on the growth, ripening, fresh weight, grade and percentage of total solids of the fruit. Rate of ripening was not affected by leaf removal. Dry weight, percentage total solids and number of fruits set were more consistently affected by leaf removal than rate of fruit enlargement, volume or fresh weight. In a few cases the leaves immediately above a cluster appeared to affect fruit set and development in that cluster, especially when the fruits were small at the time of leaf removal. In general, however, leaf area had more influence than leaf position on fruit quality.—Ohio St. Univ.

3925. RYBČENKO, O. I.
The development of ovules in parthenocarpic forms of tomato. [Ukrainian, with Russian and English summaries $\frac{1}{2}$ p. each.] *J. Bot. Acad. Sci. Ukr.*, 1959, **26**(1): 44-56, bibl. 12, illus.

Sterile ovules may occur in two ways in normal fruiting types of tomato. The developmental anatomy of both types of sterile ovule is described in some detail. In affected fruits, which develop parthenocarpically, the chloroplasts and starch grains remain unchanged for an unusually long time and large amounts of auxins tend to accumulate.

3926. VAN DIE, J.
Diurnal rhythm in the amino-acid content of xylem exudate from tomato plants bleeding under constant environmental conditions.
On the synthesis of carboxylic and amino acids in the roots and their transport to aerial parts of the tomato plant.
Reprinted from *Proc. kon. ned. Akad. Wetensch. Ser. C.*, 1959, **62**: 50-8, bibl. 30, and 505-17, bibl. 15.

In the first paper it is shown that under constant conditions the amino-acid concentration of the xylem exudate had a pronounced daily rhythm with a maximum between 11 a.m. and 1 p.m. and a minimum during the night. In the second paper the absence of any such rhythm is noted in the keto acids, of which the main component is α -ketoglutaric acid. When a solution of potassium- C^{14} -bicarbonate was supplied to the roots of tomatoes, most of the consequent activity was found in the organic acid fraction, only 15% in the amino acids and a small amount in the α -ketoglutaric acid.

[For earlier work see *H.A.*, 29: 1427.]—Plant physiol. Res. Centre, Wageningen.

3927. HEINZE, W.

Untersuchungen über den Kohlenhydrathaushalt bei Tomaten nach Behandlung mit 2,3,5-Trijodbenzoesäure. (**Studies on the carbohydrate balance in tomatoes after treatment with 2,3,5-triiodobenzoic acid.**)

Naturwissenschaften, 1958, **45**: 169-70, bibl. 5.

The leaves of treated plants contained more sugar but fewer total carbohydrates and markedly less starch than the leaves of untreated plants. The stems, however, showed a higher content of nearly all the carbohydrate fractions. Saccharase and amylase activity was increased in the leaves of treated plants. The findings indicate an increased translocation of carbohydrates from the leaves to the stem following treatment.—Landw.-gärtner. Fak., Humboldt-Univ., Berlin.

3928. ŠEBÁNEK, J.

Příspěvek ke vztahu stimulatorů k vodnímu režimu rostlin. (**A contribution concerning the relationship between growth stimulators and the water regime of plants.**) [English and Russian summaries $\frac{1}{2}$ p. each.]

Acta Univ. Agric. Silv. Brno, Ser. A, 1959, No. 4, pp. 529-38, bibl. 16.

The action of TIBA was found to be the opposite of that of heteroauxin; when sprayed on to tomatoes and lettuce it reduced transpiration and increased the dry matter content as well as the water retaining capacity of the plants, thereby increasing drought resistance. This reduction in the water requirement of the plant occurred only in those parts which developed after the application of TIBA, which might therefore afford a means of reducing vegetative growth in crops grown for flowers or fruit.

3929. SANDER, H.

Tomatin ein möglicher Ausgangsstoff für die Lycopinbildung. (**Tomatine, a possible precursor of lycopene.**)

Naturwissenschaften, 1958, **45**: 59, bibl. 8.

Tomatine disappeared from tomato fruits on the biosynthesis of lycopene, but it remained present in other above-ground parts of the plant. Pigments in the non-red sub-genus *Eriopersicon* and in other *Lycopersicon* spp. are also discussed.—PflPhysiol. Inst., Freien Univ. Berlin.

3930. SANDER, H.

Über Blütenentwicklung und Tomatingehalt bei *Lycopersicon glandulosum* Mull. (**On the flower development and tomatine content of *Lycopersicon glandulosum*.**)

Naturwissenschaften, 1959, **44**: 547, bibl. 3.

Tomatoes—diseases and pests.

(See also 3548, 4618, 4620, 4621, 4634.)

3931. CIFERRI, R.

Malattie del pomodoro nella pianura padana. (**Tomato diseases in the Po valley.**) [English summary $\frac{3}{4}$ p.]

Not. Mal. Piante, 1959, No. 49/50, pp. 99-100.

The relative prevalence and seriousness of various physiological, bacterial, fungal and virus diseases of tomatoes in the area are discussed. Since the large-scale replacement of copper fungicides by organic preparations, septoria leaf spot has markedly increased. Zineb has successfully controlled most of the other fungus diseases except leaf mould (*Cladosporium fulvum*), against which ziram has given better results.

3932. SIMONS, J. N., ORSENIGO, J. R., AND STALL, R. E.

Potato virus Y in peppers and tomatoes: history and importance on the lower East Coast; weed control and bacterial spot relationships.

Mimeo Rep. Everglades Stat. Fla **59-31**, 1959, pp. 11, bibl. 1.

Details of the history and spread of this virus and the following suggested methods of control are discussed in the first section of this report: eliminate weed hosts; use non-susceptible barrier crops around the field; avoid planting spring crops next to diseased autumn crops; and maintain plants free from other diseases. Section II lists the following recommended methods of controlling the host plants *Solanum gracile*, *S. nigrum* and *Physalis* sp. (also *Melothria pendula* the host plant of watermelon mosaic virus): off season control (ditchbanks only)—flame treatment, 2,4-D + 2,4,5-T each at 0.75-1.00 lb./acre a.e., or 2,4,5-T 1.5 lb./acre a.e.; crop season—flame treatment, AMS 50 lb./acre in 100 gal. water applied as a foliage wetting spray, or PCP-fortified diesel oil emulsion. Section III discusses the source, spread and control of bacterial spot.—*Weed Abstr.*, 9, No. 555.

3933. KOVAČEVSKI, I.

Stolbur disease and its control in Bulgaria. [Russian.]

Meždunar. s.-h. Ž., 1959, **3**(5): 65-72.

Symptoms of stolbur disease in sweet pepper, eggplant, tomato, tobacco, *Atropa belladonna* and *Datura stramonium* are described. Of 34 wild solanaceous plants only *Nicandra physaloides* and *Solanum aviculare* proved resistant to the virus. All chemical measures against the disease proved unsatisfactory, and it is suggested that control measures must be applied against the vector (*Hyalesthes obsoletus*). The best insecticides tested were 0.05% Wofatox and 0.05% parathion, which

gave 100% mortality of the cicada 2 hours after application.

3934. WEBER, P. V. V.

The effect of tobacco mosaic virus on tomato yield.

Phytopathology, 1960, 50: 235-7, bibl. 10.

Susceptible and resistant tomato varieties were inoculated with TMV 9 days or 1 month after planting. The earlier inoculation significantly reduced yields of the susceptible variety Improved Garden State at the first picking, 11½ weeks after inoculation, and the later inoculation significantly reduced yields at the second picking, 9½ weeks after inoculation. With the more tolerant W-R Brookston selection results were similar, except that late inoculation reduced yields in the first as well as in the second picking. This selection is therefore an exception to the hypothesis that the earlier the infection the greater is the reduction in total yield. Yields of the tolerant MStW210-5 selection were relatively unaffected by the inoculations. The results suggest the possibility, particularly where the early yield is not very important, that early inoculation of certain varieties with an appropriate mild strain of TMV might be a means of avoiding an economically significant loss in total yield through later infection.—Campbell Soup Co., Riverton, N.J.

3935. BEL'TJUKOVA, K. I., AND KULIKOVSKAJA, M. D.

Arenarine as a substance for the control of bacterial canker and other diseases in tomatoes and as a factor for increasing their productivity. [Ukrainian, with Russian summary 1 p.]

J. Microbiol., Kiev, 1959, 21(3): 13-24, bibl. 2.

Arenarine, the antibiotic substance from *Helichrysum arenarium*, is a complex of essential oil, pigments, acids, aldehydes, phenol and resin. At 1 to 2 p.p.m. the substance depressed the growth of *Corynebacterium michiganense*. In 5 years' trials in several parts of the U.S.S.R. arenarine was found to increase and to hasten seed germination. Plants from seeds treated with arenarine flowered 3-4 days earlier, and set 11-47% more fruit, than untreated plants. In the Ukraine yields were increased by 10-42.5% and in other regions the disease incidence was halved. Arenarine controlled all strains of *C. michiganense* and also reduced markedly the incidence of *Xanthomonas vesicatoria* and of viruses in all regions. In a comparative trial arenarine proved much more efficient in controlling the diseases and increasing yield than did Granosan.

3936. BEL'TJUKOVA, K. G., KULIKOVSKAJA, M. D., AND GVOZDJAK, R. I.

The effects of spraying tomatoes with arenarine. [Ukrainian, with Russian summary 6 lines.]

J. Microbiol., Kiev, 1959, 21(4): 31-4, bibl. 4.

This antibiotic substance, obtained from *Helichrysum arenarium*, proved very effective against bacterial canker [*Corynebacterium michiganense*] of tomatoes. When a solution of 1 : 10,000 of arenarine was sprayed on to tomatoes during bud formation stages the fruit yield was increased by 19-30% and fruit size by 21-30.8%. The treatment caused a marked reduction in bacterial canker.

3937. COOK, A. A.

Bacterial spot of tomatoes.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 143-4.

The treatment of artificially infected tomato seeds with a mercuric chloride soak (1 : 100 for 10 min.) reduced infection from an average of 53 to 3.1%. Hot-water treatment of seeds (50° C. for 30 min.) reduced the number of infected plants in two experiments from 71.8 and 53% to 1.4 and 0.5%, respectively, without affecting germination.

3938. MARRAS, F.

Osservazioni sulla "muffa grigia" dei pomodoro (*Botrytis cinerea* Pers.). (Notes on tomato grey mould.)

Riv. Ortoflorofruttic. ital., 1959, 43: 498-507, bibl. 19, illus.

Field and greenhouse trials on 2 varieties showed that infection chiefly occurs through wounds, particularly those due to badly executed pruning.—Ist. Pat. veg., Univ. Sassari.

3939. SMITH, H. C., AND HURNDILL, L. C.

Control of *Didymella* stem rot of tomatoes.

N.Z. Comm. Gr., 1959, 15(4): 9-12, illus., and *N.Z. J. Agric.*, 1959, 9: 577-83, illus.

In trials at Lincoln in 1958-59, in which 10 treatments were compared, maneb at 0.5 and 1.0% and captan at 0.25 and 0.5% gave excellent control of *D. lycopersici*, the increases in yields obtained ranging from 81% for the 0.5% maneb to 118% for 1.0% maneb. The addition of ethyl mercury phosphate to captan and maneb did not result in better control. No varietal differences in susceptibility were found. The control measures recommended are thorough sanitation and fortnightly spraying with 0.25% captan.

3940. SCHEFFER, R. P.

Variations in respiratory responses in fusarium-infected tomato plants.

Phytopathology, 1960, 50: 192-5, bibl. 9.

Leaves from tomato plants infected with *Fusarium oxysporum* f. *lycopersici* and grown in a low-N regime had a much higher oxygen uptake than leaves from uninfected low-N controls. Plants grown in a high-N regime did not respond to infection by increased oxygen uptake by leaves. The degree of stimulation of oxygen uptake varied with the season, being at a maximum under conditions of high light intensity and long days, and at a minimum under low-light short-day conditions. Results

were comparable for stem tissue containing the causal fungus in minute amounts. These results suggest that such disturbances may be secondary factors in pathogenesis. [From author's summary. See also *H.A.*, 29: 540.]—Mich. St. Univ., E. Lansing.

3941. LEBLOND, D., AND RICHARD, M.-A.
Essai de fongicides sur les tomates. (A trial of fungicides on tomato plants.)
Rapp. Minist. Agric. Québec 1958-59, 1959, p. 54.

Of the 5 fungicides applied for control of late blight (*Phytophthora infestans*) of tomatoes maneb gave distinctly the best results and the highest yield. The degree of control with other compounds decreased in the order: bordeaux mixture, zineb, Thioneb, and captan, whereas in the previous year captan gave the best results, with bordeaux 2nd and maneb 3rd. The explanation appears to lie in the development of strains of *P. infestans* possessing resistance to captan.

3942. WILSON, J. D.
New versus older fungicides for the control of late blight.
Res. Circ. Ohio agric. Exp. Stat. 69, 1959, pp. 22, bibl. 3, illus.

Experiments on both potatoes and tomatoes are described. In 4 experiments on tomatoes maneb generally gave the best control of the disease complex, which included early and late blight, fruit rots, anthracnose fruit rot and defoliation from all causes. A better yield and anthracnose control were obtained with Phaltan. Tribasic copper and Fungicide 658 gave good control of late blight. Dyrene gave fair control of anthracnose but not of late blight, whereas the opposite effects were obtained with Kepone.

3943. WILSON, J. D., AND IRONS, F.
The swath pattern of tomato disease control with an air-blast sprayer.
Res. Circ. Ohio agric. Exp. Stat. 77, 1959, pp. 12, bibl. 6, illus.

Air-blast and hydraulic methods of applying fungicides to control late blight, *Phytophthora infestans*, were compared. Better control of the disease was obtained (1) when the pressure at which the spray material was introduced into the blast of air was low, (2) by using a wettable powder instead of an oil suspension, and (3) by ensuring that the spray applications were made at proper time intervals, when the air was comparatively quiet, and at swath widths which were not too great for the capacity of the machine. Applications of 10 gal./acre gave as good control as 40 gal./acre, provided that the same amount of fungicide was applied per unit area. [See also *H.A.*, 30: 787.]

3944. MOHR, H. C., AND WATKINS, G. M.
The nature of resistance to southern blight in tomato and the influence of nutrition on its expression.
Proc. Amer. Soc. hort. Sci., 1959, 74: 484-93, bibl. 14, illus.

No cases of resistance to southern blight (*Sclerotium [Pellicularia] rolfsii*) were found in any variety of *Lycopersicon esculentum*, but one *L. pimpinellifolium* accession, T-514, proved to be resistant. This resistance was shown to be due to an anatomical character, namely, to complete phellogen development in the lower stem and to the production of substantial amounts of phellem in this area. When T-514 plants were grown on soils low in calcium the degree of resistance was reduced, but when they were grown on a soil high in Ca resistance was increased, and approached immunity. It was also observed that some plants of the normally susceptible variety Red Rock developed considerable resistance to southern blight when grown on the high-Ca soil, although not to the extent that T-514 plants did. The application of calcium nitrate to potted plants of a susceptible variety several weeks before inoculation with *Sclerotium rolfsii* prolonged the life of these plants by 2-3 weeks compared with the check plants. It was shown that the Ca rather than the N was responsible for this increase in resistance.—Texas agric. Exp. Stat., College Station.

3945. TOUZEAU, J.
Observations et essais de lutte contre la septoriose de la tomate en Tunisie en 1957-1958. (Observations and control trials on tomato leaf spot in Tunisia in 1957-58.)
Fruits et Prim., 1959, 29: 123-30.

Leaf spot [*Septoria lycopersici*] developed rapidly in rainy weather and at mean temperatures of 10-22° C. and a R.H. of 70-87%. Fungicides at the normal rates did not prevent the spread of infection in cases of very great virulence, but they retarded the development of the disease and limited desiccation of the leaves, permitting better fruit set and yields. In trials on 3 varieties the highest mean yields, 4,063, 3,925 and 3,807 kg. per ha., were obtained with 250 g. 50% captan per hl., 250 g. 65% zineb per hl. and 200 g. 20% copper oxinate per hl., respectively, applied weekly for 2-4 months from October to February. The yield of the control was 710 kg. per ha.

3946. HARDING, J. A.
Evaluation of insecticides for tomato suckfly control.
J. econ. Ent., 1959, 52: 1219-20, bibl. 6.

Sixteen insecticides were compared against *Cryptopeltis notatus* on tomatoes. Statistical analysis of the results showed that 7 days after application dimethoate was the most effective followed by

demeton, Perthane, ronnel and Thiodan.—Tex. agric. Exp. Stat., Crystal City.

3947. MASON, H. C., HENNEBERRY, T. J., AND LEHR, R.

Experiments with insecticides for the control of drosophila breeding.

J. econ. Ent., 1959, **52**: 1136-8, bibl. 6.

In experiments under field conditions at Beltsville, Maryland, one application of the following insecticides gave good control of drosophila (*D. melanogaster*) breeding in piles of cull tomatoes: aldrin, dieldrin, ethion, heptachlor, chlordane, methoxychlor, ronnel and Dipterex. Malathion, the only insecticide tested under commercial conditions, also gave good control of drosophila breeding in tomato skin piles on the Eastern Shore of Maryland. [Author's abstract.]

3948. MASON, H. C., AND HENNEBERRY, T. J.
Drosophila breeding in refuse from tomato canneries.

J. econ. Ent., 1960, **53**: 8-11, bibl. 4, illus.

Very little breeding occurred when the refuse was spread thinly over a field with a manure spreader.

3949. ORTIZ, D. S., AND CARRASQUERO R., A.
Estudio sobre residuos de parathion en tomates. (A study of parathion residues in tomatoes.) [English summary $\frac{1}{4}$ p.]

Agron. trop. Maracay, 1958, **8**: 9-15, bibl. 14.

Tomatoes sprayed in the field with 0.1% Folidol E-605 (46.87% parathion) were analysed daily for residues. By the 4th day after treatment the total parathion content of the fruit had fallen below the permissible level of 1 p.p.m., and by the 6th day the total value was 0.7 p.p.m., and that for the interior of the fruit was 0.57 p.p.m. The disappearance of parathion was more rapid from the skin than from the interior.

Tomatoes—fruit composition and cooling.

(See also 3223, 3224, 3922, 3929, 3930.)

3950. TAKAHASHI, T., AND NAKAYAMA, M.
Studies on the coloration of tomato fruits.

III. The effect of light on the pigment content of the fruits. [Japanese, with English summary $\frac{1}{2}$ p.]

J. hort. Ass. Japan, 1959, **28**: 165-9, bibl. 7.

Using the variety Kurihara one half of the flower clusters were shaded by leaves and the other half exposed to sunlight. Chlorophyll, carotene and xanthophyll contents were much higher in exposed fruits. The lycopene content in fruits 40-55 days after flowering was much higher in shaded fruits. Reducing and total sugar contents in exposed fruits were greater until the mature green stage, but when fully mature, 60 days after flowering, they were higher in the shaded fruits. On the 25th and 60th days after flowering the exposed fruits were divided into upper and lower halves; chlorophyll, carotene, xanthophyll and sugar in the young fruits, and carotene and xanthophyll in the mature fruits, were much higher in the lower half, but in the mature fruits the lycopene and sugar contents were higher in the upper half. On the same dates other exposed fruits were divided into exposed and shaded halves. Chlorophyll, carotene and xanthophyll contents in immature fruits and carotene and xanthophyll contents in mature fruits were much higher in the exposed side, but in the mature fruits the lycopene content was higher in the shaded portion. [For Part I see *H.A.*, 29: 559t.]

3951. KASMIRE, R. F., BRENDLER, R. A., AND GUILLOU, R.

Field heat removed rapidly by forced-air cooling of vine-ripe tomatoes.

Calif. Agric., 1960, **14**(2): 10.

An outline is given of a fan system, using ice as the cooling agent, in which 8 tons of tomatoes in stacked boxes were cooled to the half-way point between their initial temperature and that of the ice in 47 minutes. The cooling rate was proportional to the average temperature difference between the tomatoes and the ice. The coldest tomato was never more than 6° F. below the average temperature reached by the tomatoes.—Univ. Calif., Davis.

TOBACCO.

General.

(See also 4376, 4377, 4608, 4616.)

3952. RETIEF, D. F.
The development of tobacco production and research in South Africa.

S. Afr. J. Sci., 1959, **55**: 247-54.

History, production and consumption, cultural problems and research.

3953. MICHEL, J.

Note sur l'introduction de la culture du tabac comme culture d'appoint en milieu indigène en territoire de Kaniama (Province du Katanga). (A note on the introduction of tobacco as an additional crop in native agriculture in the Kaniama district (Katanga Province).) [Flemish summary 1 p.]
Bull. agric. Congo belge, 1959, **50**: 1283-94, illus.

Kentucky tobacco was successfully introduced in 1957-58. The crop follows cotton, receives 500 kg. of 6-16-12 fertilizer per ha. and yields 790-940 kg. of cured leaf per ha.

3954. BARNIER, G.

Les tabacs Carmen de Colombie. (**The Carmen tobaccos of Colombia.**)

Rev. int. Tabacs, 1959, **34**: 75, 77.

In Colombia tobacco growing is confined to the neighbourhood of Carmen de Bolivar. Notes are given on annual production, area under cultivation, soil, cultural practices and harvesting. The local variety Carmen Criollo yields cigarette tobacco containing 2% nicotine. Carmen Cubita, of Havana origin, produces cigar tobacco containing 2-3% nicotine.

3955. GUTIERREZ, M. E.

Production of quality Virginia leaf tobacco.

Philipp. J. Agric., 1956 (issued 1959), **21**: 55-64, bibl. 6.

Methods of growing and curing for high quality.

3956. PUZZILLI, M., AND CREMASCHI, D.

Note tecniche di tabacchicoltura. (**Technical notes on tobacco growing.**)

Tabacco, 1959, **63**: 307-41, bibl. 4, illus.

In Italy; from seed-bed to curing.

3957. CREMASCHI, D.

Le macchine nella tabacchicoltura. (**Machinery in tobacco growing.**)

Tabacco, 1959, **63**: 258-69, illus.

Transplanting and stringing machines are described and illustrated.

3958. DU PLESSIS, D. P.

High rainfall affects tobacco yields adversely.

Fmg S. Afr., 1960, **35**(11): 23-5, illus.

Experiments and observations made at the Central Tobacco Research Station, Rustenburg, during the past 16 years have shown that precipitations of more than 20 in. during the tobacco season cause a sharp decline in production.

Breeding and varieties.

(See also 4623.)

3959. PATEL, G. J.

Estimates of genotypic and phenotypic variances and covariances in a high and a low yielding population of flue-cured tobacco and their implications in selection.

Diss. Abstr., 1959, **20**: 1549-50, being *L.C. Card No. Mic.* 59-4692, of 73 pp.

Plant-type characters in general were found to be more dominant than yield and quality characters. There was a high correlation between plant height and cured leaf yield. Plant height appeared to be a better selection criterion for yield improvement than flowering time and leaf number.—N.C. St. Coll.

3960. JONES, G. L., MATZINGER, D. F., AND COLLINS, W. K.

A comparison of flue-cured tobacco varieties repeated over locations and years with implications on optimum plot allocation.

Agron. J., 1960, **52**: 195-9, bibl. 4.

For most of the 9 agronomic and chemical characters studied variety $\times$ environment first order interactions were small and non-significant. But the interaction of variety $\times$ location $\times$ year was highly significant, although small in relation to the variety component for most of the characters. This second order interaction indicated that there is some differential response to environment, but that it is not accounted for by the year or location. The variety $\times$ environment interactions appeared to arise from specific experimental conditions such as rainfall pattern, disease infestation, etc. From a comparison of theoretical variances of treatment means with varying plot allocations, adequate information on the relative performance of tobacco varieties in North Carolina can be estimated from data obtained in 2 years at each of 5 locations with replications.—N.C. agric. Exp. Stat., Raleigh.

3961. WHITE, S. B., JR., AND MATZINGER, D. F.

Correlation studies between green and cured weights of flue-cured tobacco.

Tobacco, N.Y., 1960, **150**(3): 21-4.

Eight varieties and all possible F_1 crosses were studied. It was found that within primings there was little difference between the variety and F_1 correlations; both were positive and large, around 0.9. The correlations increased slightly in the later primings. The correlation is high enough for a tobacco breeder to use the green weight as an index for selecting high yielding lines. [From authors' summary].—N.C. St. Coll., Raleigh.

3962. TERNOVSKIJ, M. F.

The use of wild tobacco species in breeding for resistance to diseases. [Russian, with English and German summaries.]

Vestn. s.-h. Nauki, 1958, **3**(1): 137-9, from *Ref. Ž. (Biol.)*, 1958, No. 19, Abstr. 87,182.

Crossing tobacco with *Nicotiana glutinosa* gave rise to some new varieties with combined resistance to tobacco mosaic virus and powdery mildew. *N. glauca* induced resistance to tip chlorosis in mahorka [*N. rustica*].

3963. GUTIERREZ, M. E.

Identification of tobacco varieties within the type by flower coloration.

Philipp. J. Agric., 1956 (issued 1959), **21**: 31-43, bibl. 12, illus.

A key with 8 coloured plates is given for the identification of the flowers of 8 types of White Burley and 14 of Virginia (bright) tobacco.

3964. GUTIERREZ, M. E.
Newly developed Virginia varieties Golden special and Golden Boon.
Philipp. J. Agric., 1956 (issued 1959), 21: 45-51, bibl. 8, illus.
 Golden Special (Golden Harvest $\times$ Yellow Special) and Golden Boon (Golden Harvest $\times$ Bonanza) gave 14.9 and 29.5% greater total yields, respectively, than the averages of their parents, and 32.0 and 92.5% greater lemon-yellow leaf yields.
3965. MADAMBA, U. V., AND EDROZO, L. B.
Variety test of white burley tobacco at Luna Mountain Province.
Philipp. J. Agric., 1956 (issued 1959), 21: 123-31, bibl. 7, illus.
 Of the 5 varieties studied Ky 16 had the best quality, but Johnson Root-rot Resistant gave the highest yield [as in earlier trials, see *H.A.*, 28: 3797].
- Seeds and seed-beds.**
 (See also 4012, 4013.)
3966. PSAREVA, E.
Variability of tobacco seed and the morphological characteristics of the plants. [Russian.]
Bull. nauč.-tehn. Inf. VITIM, 1957, No. 3, pp. 32-8, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,463.
 Seeds from capsules on the periphery of the inflorescence were lighter and produced plants which differed from the phenotype obtained from the central seeds, in that they took longer to mature, their yields were smaller and their leaves were elongated. The removal of these lateral capsules is recommended.
3967. KRISHNAMURTHY, I. V. G., AND RAO, V. V. R.
Studies on "light" and "heavy" seed in tobacco.
Indian Tobacco, 1959, 9: 217-20.
 Tobacco seeds were separated by water flotation and compared in trials. The "light" seed was equal to, or slightly better than, the "heavy" seed in actual weight, in volume and in germination, yield of seedlings and crop yield.—*Cent. Tob. Res. Inst.*, Rajahmundry.
3968. KRISHNAMOORTHY, T.
Instructions for raising tobacco nursery in Madurai district.
Indian Tobacco, 1959, 9: 237-9, illus.
 Soil preparation, cultivation, disease and pest control.
3969. JALIHAI, K. A.
Bidi tobacco nurseries for Nipany tract.
Mysore agric. J., 1959, 34: 88-92.
 Advice on management and pest and disease control.
3970. DESAI, M. V.
Diseases of tobacco nursery.
Indian Tobacco, 1959, 9: 234-5.
 Damping-off can be controlled by ensuring a well-drained seed-bed, limiting the seed rate, using clean irrigation water and spraying with 4-4-100 Bordeaux. Root knot nematodes are kept in check by crop rotation, cereals being grown in the interval between crops, and by fumigation with DD.—*Inst. Agric.*, Anand.
3971. CAMMILLI, A.
 Prove di confronto tra i vari sistemi di sterilizzazione del terraccio dei semenzai. (Comparative tests of various systems of seed-bed sterilization.)
Tabacco, 1959, 63: 270-84, illus.
 Tobacco black root-rot (*Thielaviopsis basicola*) was prevented by applying Semex, Vapam, formalin or Frux-terra universale to the seed-beds, or by using oven-sterilized compost. The best seedlings were obtained with Frux-terra universale, sterilized compost and Vapam, the last named being the most economic.
3972. CLARK, F., AND LUNDY, H. W.
Permanent seedbeds for tobacco plants.
A.R. Fla agric. Exp. Stats, 1957-58, pp. 48 and 372-3.
 Of several fumigants tested only methyl bromide produced plants of satisfactory quality; most of them controlled weeds. When organic constituents were applied after fumigation with methyl bromide, chicken and sheep manure, peat moss, vermiculite and peanut hay all gave good results.
3973. CLARK, F., AND SAUNDERS, E. S.
Supplementary heat and light for the production of tobacco seedlings.
A.R. Fla agric. Exp. Stats, 1957-58, p. 57.
 The effects of 2 soil heating treatments, 6 types of seed-bed cover and 2 sowing dates were compared. Both the heat treatments, vinyl, polythene and fibre-glass covers and later sowing advanced growth. The most rapid seedling production, amounting to 64 days, resulted from sowing on January 20 in soil continuously heated to 60° F. and using either polythene or vinyl covers. [For earlier work, see *H.A.*, 29: 566.]
3974. PRIHOD'KO, M.
The effect of bacterial fertilizers on the yield of tobacco seedlings. [Russian.]
Bull. nauč.-tehn. Inf. VITIM, 1957, No. 3, pp. 39-43, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,464.
 Azotobacterin and phosphorobacterin increased neither the height nor the number of seedlings but improved their weight and earliness, thereby facilitating earlier transplanting. More soil ad-

hered to the roots in the azotobacterin-treated plants, and this resulted in better survival on transplanting.

3975. DEAN, C. E.

The relationship between carbohydrate level and root development of tobacco transplants and the effect of some plant bed treatments on these factors.

Diss. Abstr., 1959, 20: 1516-17, being *L.C. Card No. Mic.* 59-4685 of 90 pp.

DEAN, C. E., AND WOLTZ, W. G.

Some factors affecting root development by transplanted tobacco plants.

Tobacco, N. Y., 1960, 150(6): 21-8, bibl. 10.

Reducing the total amount of available carbohydrates in tobacco seedlings by removing leaves before transplanting decreased root development after transplanting. Transplants hardened by withholding water and by low temperatures continued growth longer in complete darkness than non-hardened plants and resumed growth more rapidly after transplanting. Hardening resulted in a high level of carbohydrates and in good root development on transplanting. Although they were smaller at transplanting, 3 weeks later the hardened plants equalled the non-hardened plants in size. Growth rate increased with increased N levels. Both the available carbohydrate level at transplanting and subsequent root development were greatest in plants grown with a low level of N. Young tobacco plants were better able to utilize nitrate N than ammonium N. As the spacing in the plant bed was increased, plant size, dry weight and carbohydrate level increased. Wider spacing reduced the number of days between transplanting and flowering. There was no essential difference in the yield or value per acre of the crop produced by plants from different spacings, a result which was probably due to favourable moisture conditions at the time of transplanting.—N.C. St. Coll.

Cultural practices.

(See also 3108.)

3976.* NEAS, I.

Production practices which contribute to variation in grades throughout the plant.

Rhod. Tobacco, 1959, No. 20, pp. 6-7.

Better grade with only a slight reduction in yield was obtained by increasing spacing to 24-27 in. in rows set 42-48 in. apart. Earlier topping increased yield and improved grade. Complete desuckering increased both yield and grade by comparison with desuckering once and no desuckering. Late planting decreased both yield and grade, and the recommended date is before mid-November. Varietal differences were smaller than those due to cultural practices.

3977. MYERS, J. M., AND OTHERS.

Fertilization and culture of flue-cured tobacco.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 34, 48 and 373.

With harvesting about half completed in 1958, there were indications that non-irrigated crops produce more but poorer quality tobacco than irrigated crops. Of 3 fertilizer rates, i.e. 900 lb., 1,200 lb. and 1,500 lb. per acre, the lowest rate gave the highest yield and dollar return per acre. Ten thousand plants per acre gave a higher yield and dollar return per acre than 5,000 and 7,500 plants. Yields of tobacco planted after Pensacola bahia grass were materially higher than those of tobacco following weeds or any other grass sod. Fumigation for nematode control increased yields.

3978. KALIAPPAN, R.

A note on the effect of spacing of tobacco.

Madras agric. J., 1960, 47: 27.

Optimum spacing for basin irrigation was $2\frac{1}{2} \times 2\frac{1}{2}$ ft., and for channel irrigation 2×2 ft.

3979. KRISHNAMURTHY, I. V. G.

Topping Virginia tobacco increases yield.

Indian Tobacco, 1959, 9: 244-5.

The yield of bright leaf was increased more than 13% by topping.

Nutrition.

(See also 3974, 3977, 3989, 4020, 4379, 4633.)

3980. BRELAND, H. L., AND PRITCHETT, W. L.

Effect of fertilizer sources and levels on cigar-wrapper tobacco as related to soil and plant analyses.

A.R. Fla agric. Exp. Stats, 1957-58, p. 158.

On a soil high in exchangeable nutrients with an initial pH of 5.8 the average yield of tobacco was slightly higher in plots that received additional Mg and slightly lower in plots that received Ca and K. Yields increased progressively with N rates up to 250 lb. per acre. The highest yield but lowest grade index were obtained with a split application of N at 250 lb. An organic source of N produced higher yields than an equivalent rate of N from ammonium nitrate. A moderate rate of P (165 lb. of P_2O_5) from concentrated superphosphate produced a higher yield and grade index than higher or lower rates from the same source or from steamed bone meal. Burn decreased with increasing N and Mg but was little affected by Ca, K or P. [For earlier work, see *H.A.*, 29: 584.]

3981. DUNDAS, J.

The nitrogenous fertilization of tobacco, with special reference to the use of nitrate of soda.

[*Publ.*] *Chilean Nitrate agric. Serv.*, 1960, pp. 9, bibl. 17.

A review.

3982. SALMON, R. C., AND McDONALD, I.
Phosphate and potash fertilization of tobacco.
Rhod. Tobacco, 1959, No. 20, pp. 8-9.

As a result of 18 trials conducted during 1952-58 minimum dressings of 110 lb. P_2O_5 and 90 lb. K_2O per acre are recommended.

3983. SHEPHERD, R. J., AND POUND, G. S.
Magnesium nutrition of *Nicotiana tabacum* in relation to multiplication of tobacco mosaic virus.

Phytopathology, 1960, 50: 195-8, bibl. 9, illus. Concentrations of TMV were consistently slightly lower in Mg-deficient tobacco plants than in non-deficient plants [see also *H.A.*, 29: 3778].—Univ. Wis., Madison.

3984. ISHITOYA, K., AND OTHERS.
Studies on the effects of micro-nutrients on the tobacco plant. I. Effects of boron on the growth of tobacco plant. [Japanese, with English summary.]
Bull. Okayama Tob. Exp. Stat., 1957, No. 15, pp. 50-61, illus., from *Tob. Abstr.*, 1959, 3, Abstr. 1,579.

Tobacco plants grown in B deficient water cultures developed the following symptoms: marked changes occurred in the tip or growing point, terminal and lateral buds became light green in colour and ceased growth, leaves became thick and brittle, and the roots made poor growth and became dark in colour. The minus-B plants contained only 5.5 p.p.m. B compared with a normal content of 28.1 p.p.m. Dixie Bright grown in an excess B nutrient solution (5.0 p.p.m. as compared with 0.03 p.p.m. renewed once a week) developed marginal chlorosis and death of the lower leaves and later of the upper leaves. In pot culture Bright Yellow plants showed typical symptoms of toxicity following an application of 0.5 g. B to a pot containing 1 kg. of soil. The B content of the plants increased in proportion to the amount of B added.

3985. SCHOLZ, G.
 Über die Bedeutung des Bors für die Alkaloidproduktion von *Nicotiana rustica*.
 (On the importance of boron for alkaloid production by *Nicotiana rustica*.)
Z. PflErnähr. Düng., 1958, 80: 149-55, bibl. 6, illus.

In rooted cuttings of *Nicotiana rustica*, which were not allowed to flower, boron deficiency caused serious injury to the roots and thereby largely inhibited nicotine formation.—Inst. Kulturpfl.-Forsch. Gatersleben.

3986. SHEPHERD, R. J., AND POUND, G. S.
Influence of boron nutrition of *Nicotiana tabacum* on the multiplication of tobacco mosaic virus.
Phytopathology, 1960, 50: 26-30, bibl. 12, illus.

Tobacco plants grown in liquid nutrient solutions low in B showed characteristic deficiency symptoms and ceased growth at various times after transplanting, depending on the level of B supplied. Virus assays with expressed saps or extracts from dried tissue samples showed lower TMV concentrations in deficient plants for 1-2 weeks following inoculation. After longer periods these differences disappeared. The virus increased in the inoculated leaves of deficient plants at a rate equal to that of non-deficient plants, and after a time exceeded the concentration in the latter. [Authors' summary. See also *H.A.*, 29: 3778].—Univ. Wis., Madison.

Physiology, biochemistry and crop composition.

(See also 3101, 3133, 3139, 3985, 3989, 4002, 4003.)

3987. TOMKOVÁ, J.
Problems of auto-sterility in *Nicotiana alata* Link et Otto. Formation of the inhibitory factor in the pistil. [English, with Czech and Russian summaries 10 and 4 lines.]
Biol. plant., Prague, 1959, 1: 328-9.

Artificial cultures of pollen indicated the presence of an inhibitory factor in the pistils before pollination.

3988. DAWSON, R. F., AND SOLT, M. L.
Estimated contributions of root and shoot to the nicotine content of the tobacco plant.
Plant Physiol., 1959, 34: 656-61, bibl. 6.

The relative nicotine producing capacities of the shoot and leaf were estimated for intact and topped plants of 2 *Nicotiana tabacum* and 1 *N. rustica* varieties. In the latter 0.10% of the alkaloid contained in the shoot of the intact plant was produced in the shoot, and almost all was located in the leaves. When topped the figures were similar except that only one-half of the total plant alkaloid occurred in the leaf. Both varieties of *N. tabacum* were very similar, and in the intact plant 1-3% of the shoot alkaloid was estimated as being produced in the shoot, but only 0.5% of that present in the leaf was estimated as being produced there. Topping raised these figures to 3-8% and 0.5-3% respectively. [From authors' summary.]—Columbia Univ., N.Y.

3989. MOTHES, K., AND ENGELBRECHT, L.
Significance of several external factors for nicotine synthesis by *Nicotiana rustica*.
Planta med., 1958, 6: 319-48, from *Tob. Abstr.*, 1959, 3, Abstr. 1,699.

Synthesis of root alkaloids is highly dependent on the development of the entire plant, especially its branching and flowering. Thus it was considered essential to study the external factors which affect the development of rooted leaf shoots and single leaf plants (the latter prepared by removing all but one leaf from small plants during the first

100 days of growth, when growth represents a steady linear function of time). (1) *Auxins*: Indoleacetic acid at 1 mg./l. of nutrient solution increased root and foliage weight, with an increase in root protein and total nicotine contents, but without altering the percentage of total nicotine; higher concentrations of IAA reduced root growth and the total nicotine content but increased root protein production. (2) *Temperature*: An average temperature of 20° C. was more favourable to total nicotine synthesis than either 11–12° or 30°, as shown by fresh and dried weights, total N, root protein N and total nicotine N. Chromatograms showed that with plants grown at 30° the roots contained relatively larger amounts of four other alkaloids besides total nicotine. (3) *Minerals*: Both insufficient and excessive doses of K restricted total nicotine synthesis. Increasing applications of N promoted total nicotine formation and increased the ratio total nicotine N/root protein N. However, the differences in these one-leaf plants were much smaller than in experiments with intact plants. The roots grew most with low N concentrations and relatively high mineral salt concentrations, whereas the above-ground parts grew best with higher N concentrations and lower mineral concentrations. With low concentrations of N the roots contained more protein than the above-ground parts, whereas with higher concentrations the reverse occurred. High N concentrations were much more effective during poor light conditions in winter in increasing root protein and total nicotine production than during the summer months. When the nutrient solution was frequently changed, nitrates and urea proved of more value for total nicotine production than ammonium.

3990. GRIFFITH, T., HELLMAN, K. P., AND BYERRUM, R. U.
Studies on the biogenesis of the ring systems of nicotine.

J. biol. Chem., 1960, **235**: 800-4, bibl. 22.

See *H.A.*, 29: 3771 and 30: 851.

3991. ISHITOYA, K., AND MATSUYAMA, S.
Studies on the maturity of tobacco leaves.
III. 1. Changes of carbohydrates during the maturing period of tobacco leaves. 2. Changes of resins and cell wall materials during the maturity of tobacco leaves. [Japanese, with English summary.]
Bull. Okayama Tob. Exp. Stat., 1957, No. 15, pp. 62-7, from *Tob. Abstr.*, 1959, 3, Abstr. 1,696.

The sugar content of the leaves decreases after topping. The starch content reaches a maximum 20–30 days after topping. After topping the resins increase until the leaves become fully mature, after which the hard resin decreases while the soft resin continues to increase. Wax, gum, lignin and

pectin reach a peak at the mid-maturity stage and then decrease until the final maturity stage. In this final stage the wax and gum again increase.

3992. JEAN, D. B.

The free amino-acid content in relation to cured tobacco types.

Chem. Ind. Lond., 1960, No. 8, p. 201, bibl. 9.

Figures are given for 16 amino acids in 4 types of leaf. A large increase in the free amino-acid content, especially that of proline, occurs during curing.—Carreras Ltd., London.

3993. MOTHES, K., BÖTTGER, I., AND WOLLGIEHN, R.

Untersuchungen über den Zusammenhang zwischen Nukleinsäure- und Eiweissstoffwechsel in grünen Blättern. (Studies on the relationship between nucleic acid metabolism and protein metabolism in green leaves.)

Naturwissenschaften, 1958, **45**: 316, bibl. 2.

In *Nicotiana rustica* and *N. tabacum*.

3994. CLAYTON, R. A., AND HANSELMAN, L. M.

Tobacco nucleotide pyrophosphatases.

Arch. Biochem. Biophys., 1960, **87**: 161-6, bibl. 21.

Distribution and properties.

3995. CARUGNO, N., AND GIOVANNONZI-SERMANNI, G.

Determinazione del 3-4-benzopirene e di altri idrocarburi aromatici policiclici per mezzo della cromatografia in fase gassosa. (The determination of 3-4-benzopyrene and other polycyclic aromatic hydrocarbons by gas chromatography.) [English summary 5 lines.]

Tabacco, 1959, **63**: 285-92, bibl. 25.

A simple, rapid method described.

3996. MIHAJLOV, M. K.

On Guseva's method of determining chlorogenic acid in tobacco. [Russian, with English summary 7 lines.]

On the Wilkinson, Phillips and Bacot method of determining chlorogenic acid in tobacco. [Russian, with English summary 9 lines.]

C.R. Acad. bulg. Sci., 1959, **12**: 411-14, bibl. 17, and 525-8, bibl. 11.

Guseva's method was found to determine not only chlorogenic acid and its isomers but also other polyphenolic compounds; flavonols present in the extract of some tobaccos also caused interference. Similarly, with the method of Wilkinson *et al.* caffeic acid and other *o*-polyphenols were determined, the amount of rutin present affected the results and chlorogenic acid was not completely precipitated.

3997. FREY-WYSSLING, A., SZARKOWSKI, J. W., AND BIRNSTIEL, M. L.
Über die Oxydation von Chlorogensäure und DOPA während der Tabaktrocknung. (On the oxidation of chlorogenic acid and DOPA during the curing of tobacco.)
Naturwissenschaften, 1959, **46**: 602, bibl. 11.
The browning of tobacco leaves during curing, though largely due to the oxidation of chlorogenic acid, may also be due to pigment formation by 3,4-dioxyphenylalanine.—Eidg. tech. Hochsch., Zürich.
3998. MIKHAILOV (MIHAJLOV), M. K.
A method for determination of the flavonoids in tobacco.
Naturwissenschaften, 1958, **45**: 389, bibl. 12.
An English version of 29: 2635 and 3791i.
3999. WEAVING, A. S.
The determination of rutin in tobacco.
Tobacco, N.Y., 1960, **150**(1): 19-25, bibl. 24.
Two colorimetric methods were examined; the aluminium chloride method gave high values, but the boric acid method was not specific for rutin.
4000. ROWLAND, R. L., AND GILES, J. A.
Flue-cured tobacco. V. Polyisoprenoid compounds.
Tobacco, N.Y., 1960, **150**(8): 19-23, bibl. 18.
The percentages of solanesyl acetate and vitamin K₁ found in aged flue-cured tobacco leaf were 0.01 and 0.002-0.003, respectively.
4001. STEDMAN, R. L., AND RUSANIWSKYJ, W.
Composition studies on tobacco. X. Total paraffins and total sterols in relation to burley tobacco grades.
Tobacco, N.Y., 1960, **150**(5): 51-3, bibl. 6.
A tendency for the lower grades to show higher paraffin concentrations was noted, but no correlation was found between leaf grade and phytosterol content. [For part IX, see *H.A.*, 30: 2426.]—E. reg. Res. Lab., Philadelphia, Pa.
- Disorders, diseases and pests.**
- (See also 3933, 3962, 3968-3971, 3983, 3986, 4024, 4025, 4621, 4629.)
4002. KEFFORD, N. P.
Some growth regulators of tobacco in relation to the symptoms of the physiological disease 'frenching'.
J. exp. Bot., 1959, **10**: 462-7, bibl. 8.
Extracts of the shoot tips of normal and 'frenched' tobacco plants were chemically separated into acidic, neutral, and basic ether-soluble fractions. On chromatograms of these, some plant growth regulators were assayed using the *Avena* coleoptile section extension test. Two acidic auxins and an acidic and a neutral growth inhibitor were found. One auxin, with the same R_f value as indole-3-acetic acid, was 4 times more concentrated in normal than in 'frenched' plants. No differences could be established between the 2 types of plant in regard to other growth regulators detected. It is argued that the symptoms of the physiological disease 'frenching' could be explained in terms of an auxin deficiency. [Author's abstract.]—C.S.I.R.O., Canberra.
4003. PORTER, C. A., AND WEINSTEIN, L. H.
Altered biochemical patterns induced in tobacco by cucumber mosaic virus infection, by thiouracil, and by their interaction.
Contr. Boyce Thompson Inst., 1960, **20**: 307-15, bibl. 15.
Virus infection caused an early increase in glutamine, but after 182 hours there was a reduction in all constituents except ribonucleic and deoxyribonucleic acids. Thiouracil treatment, singly or in combination with virus infection, resulted in decreases in all constituents except the free amino- and amide-nitrogen pool, in which there was a relatively large increase due primarily to the inhibition of protein synthesis. Earlier conclusions that thiouracil interferes with protein and nucleic acid metabolism in tobacco, but not with amino-acid biosynthesis, are thus confirmed.
4004. BRUYNs-HAYLETT, J. P.
The influence of mosaic-infected tobacco crop residues in the soil on the incidence of primary mosaic infection in the subsequent tobacco crop. [Afrikaans and French summaries $\frac{1}{4}$ p.]
S. Afr. J. agric. Sci., 1959, **2**: 331-41, bibl. 12.
Neither removal of the infected plant, burial below the surface nor ploughing in had any effect on the incidence of mosaic in the subsequent crop, although an increase was obtained by adding infected material to soil hitherto free from it. Virus-infected material and/or soil was of little importance in the transmission of mosaic to subsequent crops, and infection through the roots was uncommon.—Cent. Tob. Res. Stat., Rustenburg.
4005. BOBYR', A. D.
The effect of some amino acids on tobacco mosaic virus. [Ukrainian, with Russian summary $\frac{1}{2}$ p.]
J. Microbiol., Kiev, 1959, **21**(4): 25-30, bibl. 6.
Asparagine, aspartic acid and glutamic acid, all at 0.05%, considerably depressed tobacco mosaic virus activity *in vitro*. Application of the 3 compounds at 0.01% to freshly infected *Nicotiana glutinosa* leaves also had a depressing effect on the virus, but the effect decreased with the lapse of time following infection.
4006. GOL'DIN, M. I., AND LAPIDUS, N. G.
The effect of gibberellin on tobacco mosaic virus. [Russian.]
Izv. Akad. Nauk S.S.S.R., Ser. biol., 1960, **25**: 129-31, bibl. 1, illus.

At the concentrations and exposure times tested gibberellin greatly accelerated plant growth but did not affect TMV or its reproduction either *in vitro* or *in vivo*.—Inst. Microbiol., Acad. Sci., Moscow.

4007. BRČÁK, J., POLÁK, Z., AND PINTERA, A.
The inhibitory effect of the juice of *Phytolacca americana* and *P. acinosa* on infection by the tobacco mosaic virus and beet mosaic virus. [English, with Russian summary.]
Folia biol. (Českosl.), 1957, 3: 374-81, from
Ref. Ž. (Biol.), 1958, No. 18, Abstr. 81,210.

By mixing 1 part of tobacco juice inoculum containing mosaic virus with 3 parts of juice of the *Phytolacca americana* or *P. acinosa*, necrosis on leaves of *Nicotiana glutinosa* was reduced by 94-98%.

4008. VÖLK, J.
Zur Übertragung von Tabak-Rippenbräune-Stämmen des Y-Virus auf Tabak und Kartoffel. (On the transmission of the tobacco brown rib strains of the Y virus to tobacco and potato.)
Mitt. biol. Bundesanst. Berlin-Dahlem, 1959, No. 97, pp. 69-71.

By aphids and also mechanical means.

4009. DAVIDE, R. G., AND ORILLO, F. T.
Biological test of fungicidal spray stickers on the control of cercospora leaf spot of tobacco.
Philipp. Agric., 1959, 43: 386-96, bibl. 9, illus.

All the stickers tested increased spray retention considerably, but the average incidence of leaf infection was significantly lower when 14% rubber latex or Goodrite P.E.P.S. was added to fungicides than with other formulations. Natural rubber latex was compatible with the fungicides Orthocide 50W, Parzate, ziram, Flit 406 and Fermate.

4010. COLE, J. S.
Further studies of tobacco anthracnose in Southern Rhodesia.

Ann. appl. Biol., 1959, 47: 698-707, bibl. 4.
Results of laboratory tests in Southern Rhodesia indicate that *Colletotrichum tabacum*, Böning, the causal organism of tobacco anthracnose, could survive in dry soil for 13-17 weeks and therefore might survive from one season to the next in dry soil in the absence of tobacco-plant residue. The most favourable conditions for survival arose when soils of high organic content dried out fairly soon after being infected; soils which remained moist were the least favourable. Chemical control of soil infection with methyl bromide gas at 1 lb./100 sq. ft. was effective and not phytotoxic. Of the available powders used as soil disinfectants, thiram was more effective than zineb or maneb, but all were phytotoxic at certain concentrations. Phytotoxicity to tobacco, which took the form of stunting and poor root growth, varied with different com-

mercial preparations of thiram and zineb. [Author's summary.]—Tob. Res. Bd. Rhodesia and Nyasaland.

4011. MANDRYK, M.
Host-pathogen relationship in tobacco plants with stems infected by *Peronospora tabacina* Adam.

Aust. J. agric. Res., 1960, 11: 16-26, bibl. 15, illus.

The development of the fungus was favoured by high humidity but inhibited by exposure to benzol vapour and by a diurnal temperature range of 75-105° F. with R.H. below 70%. The spread of mycelium from the leaves into the stem was not prevented by high day followed by low night temperatures. When the pathogen became established in the cambial region of the stem at an early stage of plant growth, xylem development was often inhibited. Such plants, when full grown, were brittle and apt to snap off at the base.

4012. PLANTENZIEKTENKUNDIGE DIENST, WAGENINGEN.

Valse meeldauw in tabak (*Peronospora tabacina* Adam). (Blue mould of tobacco.)
Vlugschr. PlZiekt. Dienst, Wageningen, 76, 1959, pp. 4, illus.

Measures recommended include disinfecting seedbeds with formalin and spraying plants in the seedbed and field with zineb or ferbam.

4013. MARCELLI, E.
Un marciume del piede del tabacco in semenzaio e in campo causato da *Phytophthora* sp. (A foot rot of tobacco in seed-beds and plantations caused by *Phytophthora* sp.)
Tabacco, 1959, 63: 235-57, bibl. 55, illus.

Resistant strains and control measures against tobacco black shank, now reported on Italian tobacco, are discussed.

4014. RABB, R. L., AND OTHERS.
Tobacco insects of North Carolina and their natural enemies.

Bull. N.C. agric. Exp. Stat. 394, revised 1959, pp. 32, illus.

This bulletin describes and illustrates numerous pests of field and store. There is a section on natural enemies, but no direct chemical control measures are described.

4015. TAPPAN, W. B.
Control of insects attacking cigar-wrapper tobacco.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 334-5.

Parathion at 1% gave effective control of green peach aphid. Thiodan at 3.5%, alone or with zineb at 6.5%, also showed good control but was somewhat slower acting; it was much better than parathion against budworm, hornworm and

cabbage looper. Parathion at 1% + TDE at 10% + zineb at 6.5% was less effective than thiodan against the hornworm and looper, but as good as it for budworm control. Parathion at 1% + DDT at 10% + zineb at 6.5% was almost equal to the parathion + TDE + zineb mixture for hornworm and looper control but was less effective against the budworm.

4016. BALEVSKI, A.

Aerial control of thrips and tobacco leaf aphid. [Bulgarian.]

Bull. Plant Prot., Sofia, 1957 (issued 1958), 6(4): 65-8.

During a severe outbreak of thrips infestation of tobacco in southern Bulgaria spraying from an aeroplane with a solution of 35% active parathion gave 100% control within 2½–3 hours. Systox also gave very good results. Aphids were also completely eradicated by the treatments.

4017. BEGG, J. A., AND HARRIS, C. R.

Preliminary report on control of the black cutworm, *Agrotis ypsilon* (Rott.), with aldrin incorporated into the soil in various ways.

A.R. ent. Soc. Ontario 1958, 1959, 89: 45-7, bibl. 3.

Aldrin at 1.7 lb. per acre, sprayed on the soil surface as a water-emulsion or applied in fertilizer and cultivated or drilled to various depths into a sandy loam soil, did not control an artificial infestation of the black cutworm, *Agrotis ypsilon*, in flue-cured tobacco in the first 3 days after the plots were infested. During the next 3 days the surface spray harrowed to 1–2 in. or disked to 4–6 in. and the broadcast fertilizer mixture harrowed into the soil resulted in 18% or fewer injured plants in comparison with 39% in the untreated plots. From 6 to 9 days the surface treatments harrowed into the soil reduced injury from 11% to 4% or less. The surface spray disked into the soil was significantly less effective. The fertilizer mixture drilled 1–2 or 3–4 in. into the soil provided no protection. [From authors' summary.]—Ent. Lab., Chatham, Ontario.

Curing, grading and storage.

(See also 3227, 3955, 3992, 3997.)

4018. ROBERTSON, W. R.

Curing with the wet and dry bulb thermometer. *Rhod. Tobacco*, 1959, No. 20, pp. 10-11, illus.

Advice on the control of temperature and humidity in the barn.

4019. BENNETT, R. R., HAWKS, S. N., JR., AND RITCHIE, R. M.

Does your tobacco sweat?

Ext. Folder N.C. agric. Ext. Serv. 170, 1959, 1 folded sheet, illus.

Advice on barn ventilation.

4020. MYERS, J. M., CLARK, F., AND HARRIS, H. C.
Curing bright leaf tobacco grown under different levels of nitrogen.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 35-7 and 52-3.

Tobacco fertilized with 24 lb. N/acre showed the highest quality when yellowed at 105° F., that fertilized with 48 lb. N/acre when yellowed at 100° F. and that fertilized with 96 lb. N/acre when yellowed at 95° F. Tobacco harvested at optimum maturity gave a better quality product than that harvested 7 days before or 7 days after optimum maturity for all the 3 levels of N and for 3 levels of curing humidity and temperature tested. The value of cured tobacco fertilized with 48 lb. N/acre ranged from \$49.60 per cwt. for that harvested green to \$60.60 per cwt. for that harvested mature when cured at 100° F. and 85% R.H. Tobacco harvested when over-mature averaged \$58.50 per cwt. [For earlier work, see *H.A.*, 29: 619.]

4021. JOHNSON, W. H., AND OTHERS.

Bulk curing tobacco.

Res. and Fmg. N.C., 1959, 18(1): 4-5, illus.

Bright-leaf can be cured in bulk.

Agric. Res. Wash., 1959, 8(6): 6, illus.

In the method described whole leaves are stacked evenly in frames, which are clamped in racks in special barns that are much smaller than conventional barns, air from the furnace being forced through the tobacco at 30 ft. per min. During yellowing the temperature is held at 90–100° F.; it is then raised gradually to 140–150° F. to set the colour and dry the leaf, and is finally advanced to 170° F. for stem drying. Quality is not adversely affected and labour requirements are reduced by 75%. Figures are given for the composition and quality of bulk-cured and conventionally-cured tobacco. Bulk-curing was less satisfactory for green shredded tobacco. It developed a good colour but an objectionable aroma, and the sugar and nicotine contents were reduced.

4022. PEENS, J. F.

Tobacco is prepared for marketing in cellar and sorting-room.

Fmg S. Afr., 1960, 35(11): 33-5, illus.

A diagrammatically illustrated account outlining requirements, specifications and construction of a cellar, bulking-room and sorting-room.

4023. MATHEWS, G. R., FLACK, L. D., JR., AND VAN ARSDALL, J. W., JR.

Sorting burley tobacco on the farm.

Circ. Va Polytech. Inst. agric. Ext. Serv. 840, 1959, pp. 4, illus.

Into flyings, lugs, tan and red leaf, and tips.

4024. CHILDS, D. P., AND TENHET, J. N.

Studies in warehouse fumigation of flue-cured tobacco.

Tobacco, N.Y., 1960, 150(11): 27-34, bibl. 6, illus.

A vinylite plastic spray was found to be effective as a semi-permanent seal for structural cracks, but for large openings a kraft paper retained the gas as well as the more expensive 4 mil. polythene sheeting. In well-sealed warehouses 32- and 48-oz. dosages of HCN were more effective against *Lasioderma serricorne* and *Ephestia elutella* than the standard 16 oz., and control was also improved by rapid release of the gas. With methyl bromide a 64-oz. dosage was also appreciably better than the standard 24-oz., and the disadvantage of a heavy concentration near the floor could be partly overcome by discharge through lengths of polythene tubing above the top of the hogsheads just

beneath the roof. In both cases a single application at the higher rate was as good as, or better than, 2 or 3 applications at the standard rate. [For an earlier report see *H.A.*, 29: 1598f.]—Stored Tob. Insects Lab., U.S.D.A., Richmond, Va.

4025. TENHET, J. N.

Pyrethrum mists and aerosols for control of insects in tobacco warehouses.

Mktg Res. Rep. U.S. Dep. Agric. 334, 1959, pp. 21, bibl. 14, illus.

Not as effective as fumigation, but useful under some conditions against *Ephestia elutella* and partially effective against *Lasioderma serricorne*.

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS

Condiment and spice plants.

(See also 3893-3895, 4616, 4619, 4629.)

4026. SUBBIAH, M. S., AND ABRAHAM, E. V.
A note on the flowering and fruiting in cardamon (*Elettaria cardamomum*).

Madras agric. J., 1958, 45: 191-2, from *Biol. Abstr.*, Sect. D, 1959, 33, Abstr. 19,242.

From January to March the average number of flowers per raceme was 13.3 with 3.8% setting fruit. From April to September there were 150.7 flowers per raceme with 30.7% setting fruit and from October to December 28.8 flowers in each raceme of which 19.1% set fruit.

4027. WÖHLERT, W., AND FREIMUTH, U.
Determination of inulin in chicory roots.
Z. Lebensmitt. Untersuch., 1959, 110: 371-5, from abstr. in *J. Sci. Food Agric.*, 1960, 11: i-147.

A simple paper-chromatographic technique.

4028. WINTER, E.
Über einen Pflanzenfarbstoff aus *Cichorium*. (A pigment from *Cichorium*.)
Naturwissenschaften, 1958, 45: 40-1.

A red pigment, a complex quinone, in the leaves of *Cichorium intybus* and *C. endivia* [see also *H.A.*, 29: 1509].

4029. NIKAM, B. G., KULKARNI, S. N., AND PAWAR, F. K.

Coriander and its three diseases.

Indian Fmg., 1959, 9(8): 12-13, illus.

Wilt, powdery mildew and tumour are described. Wilt, caused by soil-borne *Fusarium oxysporum* f. *coriandrii*, can best be controlled by planting resistant strains and also by treating seeds with fungicides such as "Agrosan GN". Powdery mildew, *Erysiphe polygoni*, may be controlled by dusting with fine sulphur powder (300 mesh at 10-12 lb./acre) when the plants are 2 months' old and again after setting fruit. The incidence of tumours, caused by *Protomyces macrosporus*, on flower stalks, leaves and petioles, which result in

greatly reduced yields, can be limited by burning all infected plants.—Agric. Res. Inst., Gwalior.

4030. CARLSSON, G.

Pikant 2415 OJO/55 en ny dillsort för växthus, bänk och tidig sådd på friland. (Pikant 2415 OJO/55, a new dill variety for the greenhouse, for frames and for early sowing in the field.) [English summary 7 lines.]

Meddel. Gullåsk. Växtförädl. Anst., Hammenhög, 1959, No. 15, pp. 116-18, bibl. 1, illus.

4031. ŠARYGINA, I. S.

Certain problems of the biology and biochemistry of *Origanum vulgare* and *Hyssopus officinalis*. [Russian.]

Bot. Žurnal, 1959, 44: 1124-8, bibl. 20, illus.

In Russia marjoram and hyssop are valuable aromatic, medicinal and honey plants and are also used as condiments. Results are given of cultural trials, near Leningrad, with plants propagated from seed. In both plants the inflorescences were the richest in essential oils, the total content of which reached a maximum of 0.27% of dry weight in marjoram and of 0.47% in hyssop at the end of July.

4032. D[UTTA], S. K.

Mustard (*Brassica nigra* or *Sinapis nigra*).

Ser. Tea Res. Inst. Tocklai 140, 1959, pp. 2.

General advice on growing the crop for seed in Assam and Bengal.

4033. FAROOQ, M. O., VARSHNEY, I. P., AND RAHMAN, W.

On the glycosides of *Apium petroselinum* (parsley).

Naturwissenschaften, 1957, 44: 444, bibl. 8.

Apiin was shown to be a mixture of at least two major and one minor component.

4034. HOLLIDAY, P.

Suspected virus in black pepper.

Commonw. phytopath. News, 1959, 5: 49-52, bibl. 2, illus.

The disease, found in Sarawak, is described; there are two forms, severe and mild, the former causing considerable yield losses. Symptoms have been transmitted by grafting. Roguing and the use of virus-free cuttings are recommended.

4035. THEIS, T., AND OTHERS.

Thread blight disease of black pepper in Puerto Rico.

FAO Plant Prot. Bull., 1959, 7: 161-2, bibl. 6, illus.

The symptoms caused by *Pellicularia koleroga* are described. The disease was most prevalent during months of heavy rainfall. Excellent control was obtained with either 2 applications of bordeaux (5-5-50) or Copper A, both applied at 3-week intervals, taking care to spray the inner parts of the vines.

Drug plants.

(See also 3173, 3933, 4031, 4070, 4247.)

4036. TO, B. S.

The principal plants used for the preparation of medicines in Korea. [Korean, with Russian summary.]

Vestn. AN KNDR, 1957, No. 3, pp. 26-36, from *Ref. Ž. (Biol)*, 1958, No. 20, Abstr. 91,855.

Of some 400 Korean species used for medicinal purposes the 12 most important are discussed.

4037. ŠPILENJA, S. E.

The correlation between alkaloid and chlorophyll accumulation in the *Solanaceae*. [Russian.]

Bot. Žurnal, 1959, 44: 922-5, bibl. 12.

In leaves of *Atropa belladonna*, *Scopolia carniolica* and *Datura inermis* the contents of both alkaloids and chlorophyll were highest from bud formation to the beginning of mass flowering. Spraying *D. inermis* with 2% ammonium sulphate increased the size and prolonged the life of the plants and maintained alkaloid and chlorophyll contents at a high level for a longer period.

4038. WASICKY, R.

Herausschwemmen von Substanzen aus Blättern und seine eventuelle biologische Bedeutung. **(The leaching of substances from leaves and its possible biological significance.)**

Naturwissenschaften, 1959, 46: 172-3, bibl. 2.

Following observations that rain leaches vitamin C from rhododendron leaves [see *H.A.*, 30: 15], determinations were made, before and after a heavy fall, of the leaf contents of total alkaloids and anthraglycosides in *Pilocarpus pennatifolius* and *Cassia alata*, respectively. In both cases a large proportion of the relevant substances were washed out, but they were soon built up again after the rain. The leached substances, as far as they reach

the soil, are bound to have an important biological effect, and it is suggested that soil sickness may be among the phenomena thus accounted for.—*Fac. Farmácia Odont.*, Univ. São Paulo.

4039. NAIDU, G. V. B.

In Mysore, they grow "baje" for cash.

Indian Fmg, 1959, 9(8): 19-21, illus.

Sweet flag, *Acorus calamus*, is grown in heavy land which can be irrigated like rice. After heavy fertilization young rhizomes are planted in rows 1-1½ ft. apart. The land is then flooded and a constant water level maintained until harvest after about 10 months. The rhizomes are sun-dried and broken into pieces, the scale leaves being removed by heating. Yields of 200 maunds per acre are obtained; the crop is free from major pests and diseases. It has various medicinal uses.—*Agric. Res. Stat.*, Kythasandra.

4040. ABAD MANRIQUE, J. B., AND LUNA MORENO DE ABAD, C.

Fenómenos carenciales en las raíces de *Atropa belladonna* L. **in vitro.** **(Deficiency symptoms in the roots of *Atropa belladonna* in vitro.)**

Farmacognosia, 1959, 19: 131-63, bibl. 50.

The minor elements Cu, B, Mn, Zn and Mo were essential for maintaining normal development and vigour in root cultures of *Atropa belladonna*, the above order being that of their decreasing importance. For alkaloid biosynthesis Mo was slightly more important than Zn, otherwise the order remained as above. The addition of all 5 minor elements to a synthetic medium including sucrose and vitamins B₁ and B₆ was less effective in stimulating alkaloid synthesis than the use of a medium containing yeast extract.

4041. ALI, M. E., AND QUDRAT-I-KHUDA, M.

Bitter constituents from *Caesalpinia bonducella* Flem.

Chem. Ind. Lond., 1960, No. 17, pp. 463-4.

Three extremely bitter substances isolated from seeds of the fever nut used against malaria, etc., in Pakistan.

4042. GERTIG, H.

Dynamika gromadzenia się alkaloidów w glistniku (*Chelidonium majus* L.) w orkesie rocznej wegetacji. **(The dynamics of alkaloid accumulation in *Chelidonium majus* during the annual growth cycle.)**

Acta polon. pharmac., 1957, 14(2): 109-18, from *Ref. Ž. (Biol)*, 1958, No. 18, Abstr. 82,568.

Alkaloid contents were higher in cultivated than in wild plants. From the results of investigations made from April to the following February it is recommended that harvesting be done when the first fruits mature. Alkaloids increased in the

young leaf rosettes in April and again in September-October.

4043. CARLSSON, G.

Increased alkaloid content in *Datura stramonium* through plant-breeding. [Swedish summary 8 lines.]

Meddel. Gulläk. VäxtförädlAnst., Hammenhög, 1959, No. 15, pp. 169-75, bibl. 1, illus.

Strains of *D. stramonium*, *D. stramonium* var. *inermis* and hybrids between them compared over a 10-year period.

4044. LEETE, E.

The biogenesis of tropic acid and related studies on the alkaloids of *Datura stramonium*. *J. Amer. chem. Soc.*, 1960, **82**: 612-14, bibl. 12.

4045. ROMEIKE, A.

Zur Biogenese des Scopolamins. (The biogenesis of scopolamine.)

Naturwissenschaften, 1959, **46**: 492-3, bibl. 4.

In *Datura ferox*.

4046. LESKOVA, E. S.

The biology of seed germination in *Dichroa febrifuga* Lour. [Russian.]

Bot. Zhurnal, 1959, **44**: 1344-7.

D. febrifuga, which has long been used in the East for the preparation of anti-malarial medicines, can be grown outdoors on the Black Sea coast, but further north it has to be raised and overwintered under glass. In laboratory trials it was found that the seed could germinate only in light. The optimum temperature was 18-20°C. Germination reached 100% in freshly harvested seed, decreased slowly for the first 9 months of storage and then rapidly thereafter. Complete viability was, however, preserved in seed stored for 19 months in a Petri dish on damp filter paper in absolute darkness.

4047. HAACK, E., AND OTHERS.

Glucoverodoxin aus den Samen von *Digitalis purpurea*. (Glucoverodoxin from the seeds of *Digitalis purpurea*.)

Naturwissenschaften, 1958, **45**: 338-9, bibl. 6.

4048. ALDAY REDONNET, T.

Estudio farmacológico de la *Isoplexis isabelliana* Webb et Berth., digital de Canarias, de enorme actividad cardiotónica. (A pharmacological study of *Isoplexis isabelliana*, the Canary Island foxglove, of very high cardiotonic activity.) [English and German summaries $\frac{1}{4}$ p. each.]

Farmacognosia, 1959, **19**: 85-129, bibl. 63, illus.

Isoplexis (*Digitalis* or *Callianassa*) *isabelliana*, indigenous to Gran Canaria, probably does not contain digitalin, but is outstandingly rich in an unidentified cardiotonic substance.

4049. ALVES, A. C., PRISTA, L. N., AND DE SOUSA, A. F.

Sobre a existência de alcalóides em *Dioscorea sanzibarensis* Pax. (The existence of alkaloids in *Dioscorea sanzibarensis*.) [French and English summaries $\frac{1}{2}$ p. each.]

Garcia de Orta, 1959, **7**: 533-50, bibl. 20.

Dioscorine and 2 chemically related alkaloids were extracted from the tubers. The method of extraction and the results of tests by paper chromatography are described.

4050. DE BRUYN, J. W., AND VAN HALL, J. G.

De bepaling van kleine hoeveelheden hyoscyamine en scopolamine in geneeskruiden. (The estimation of small quantities of hyoscyamine and hyoscyne in medicinal herbs.) [English summary $\frac{1}{4}$ p.]

Pharm. Weekbl., 1959, **94**: 262-9, bibl. 8, reprinted as *Meded. Inst. Vered. Tuinbouwgew.* **152**, 1959.

The method described.

4051. GRUŠVICKIJ, I. V.

The biology of wild ginseng. [Russian, with English summary 12 lines.]

Bot. Zhurnal, 1959, **44**: 1694-703, bibl. 10, illus.

The author considers the pronounced long-term periodicity in the growth of *Panax ginseng* to be due to periodic changes in the plant community structure of the *Pinus koraiensis* forests, in which it may live for 150 to 400 years.

4052. HEEGER, E. F., AND SCHROEDER, H.

Untersuchungen über die Morphinerträge bei *Papaver somniferum* L. unter mitteldeutschen Anbauverhältnissen. (Investigations on morphine yield from *P. somniferum* under conditions of cultivation in central Germany.)

Pharmazie, 1959, **14**: 228-33, bibl. 17, from *Biol. Abstr.*, Sect. D, 1959, **34**, Abstr. 11,406.

In trials with the Mahndorf strain of opium poppy morphine yields per unit area were found to be highest during the 10-30-day period after flowering, and this is considered the best time to harvest the crop if the straw processing method is used. Five harvests were made in succession throughout July and August, and the maximum production of morphine, 10.2 kg./ha., from leaves, stems and capsules was obtained from the 4th harvest (July 24 to August 8) made when the green capsules were half ripe.—Karl Marx Univ., Leipzig.

4053. KREJER, V. G.

***Plumbago europaea* L., a valuable medicinal plant.** [Russian.]

Bot. Zhurnal, 1959, **44**: 1507-10, bibl. 10.

The literature on the medicinal properties of *P. europaea* is reviewed. Analyses showed

high tannin content and the presence of saponins, but determinations of alkaloids gave somewhat contradictory results.

4054. KUZNECOVA, G. A., AND OTHERS.

Studies on *Podophyllum peltatum* L. grown in the Leningrad region. [Russian.]

Bot. Zhurnal, 1959, **44**: 1337-40, bibl. 7.

The rhizomes and roots of *P. peltatum* contain podophyllin, the active principles of which include podophyllotoxin and peltatin, both having marked medicinal properties. The plant grows well in the Leningrad region; its roots contain 3-11% of podophyllin, its rhizomes 2-8% and its shoots 2-4%. Podophyllin from the rhizomes contained 10.5% podophyllotoxin and that from the roots 8.3%.

4055. KIANG, A. K., AND WAN, A. S. C.

Alkaloids in the roots of *Rauwolfia perakensis*.

J. chem. Soc. Lond., 1960, pp. 1394-8, bibl. 11.

The following substances were isolated in crystalline form: sucrose, a phytosterol, ajmaline, isoreserpiline, reserpine, sarpagine and two new alkaloids (pelirine and perakine). Three other, apparently new, alkaloids have been isolated as salts. [From authors' abstract. See also *H.A.*, 29: 1603.]—*Univ. Malaya*, Singapore.

4056. MININA, S. A.

The possibility of cultivating *Scopolia tangutica* in the Leningrad region. [Russian.]

Sb. nauč. Tr. Leningr. him.-farmaceut. In-t, 1957, No. 3, pp. 305-8, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,571.

S. tangutica, indigenous to China, can be grown on podzolic soils in the Leningrad region. The aerial parts contain up to 2.9% and the roots 2.6% of alkaloids on a dry weight basis, compared with 0.6% found in *S. carniolica*. The main alkaloid is tropae.

4057. GERASIMENKO, I. I., AND KIBAL'ČIČ, P. N.

Vegetative propagation of *Solanum aviculare* Forst. [Russian.]

Bot. Zhurnal, 1959, **44**: 1494-5.

S. aviculare, a possible source of cortisone, can be grown in the U.S.S.R. as an annual and is normally propagated by seed. Under certain conditions, however, vegetative propagation becomes desirable, and very good results were obtained with cuttings taken from the tips of seedlings 1.5 to 3 months old and rooted under glass.

4058. BATTERSBY, A. R., AND HODSON, H. F.

Alkaloids of calabash-curare and *Strychnos* species.

Quart. Rev. chem. Soc. Lond., 1960, **14**: 77-103, bibl. 83.

An up-to-date review of their complex chemistry.

4059. BATTERSBY, A. R., AND HODSON, H. F.

Alkaloids of calabash-curare and *Strychnos* species. Part I. Chemistry and structure of hemitoxiferine-I and toxiferine-I, including the preparation of toxiferine-I.

J. chem. Soc. Lond., 1960, pp. 736-41, bibl. 18.

4060. COSME, L. L., MARAÑON, J., AND ARIDA, V. P.

Distribution of glycosides in *Thevetia peruviana* (Pers.) Merr. and *Nerium indicum* Mill. *Philipp. J. Sci.*, 1958, **87**: 1-6, bibl. 11.

These two ornamental plants were examined as possible substitutes for digitalis. Glycosides were found to be evenly distributed throughout *Nerium*, the leaves and stems of which contained 3 times as much as those of *Thevetia*. The kernel of *Thevetia*, however, had a much higher glycoside content than that of *Nerium*. The red and yellow varieties of *Nerium* are recommended for propagation, because they contained more glycosides than the rose, pink and white varieties.—*Inst. Sci. Tech.*, Manila.

Essential oils.

(See also 4031.)

4061. ABBASOV, R. M., AND ISMAILOV, N. M.

Investigation of the essential oil plants in Lačın and Kalbadžar regions of the Azerbajdzan S.S.R. [Azerbajdzan, with Russian summary 1 p.]

Izv. Akad. Nauk AzerbSSR, Ser. biol., 1959, No. 3, pp. 9-17, bibl. 5.

Sixty-three indigenous species were examined. Of these 32 species contained 0.1% or more of essential oil. From the first group *Thymus transcaasicus*, containing 0.65% of essential oils, had a notably pleasant scent. A *Ziziphora* sp. contained 0.42% of oil. Other promising species were *Agasyllis caucasica*, *Prangos ferulaceae*, *Astradaucus orientalis*, *Heracleum sosnowskyi*, *Achillea ochroleuca*, *Inula germanica* and *Pyrethrum parthenifolium*.

4062. IVANOVA, B. I.

The problem of cultivating *Artemisia balchanorum* in the Moldavian S.S.R. [Russian, with English and Moldavian summaries.]

Izv. Mold. Fil. AN SSSR, 1957, No. 4, pp. 53-60, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,862.

The yield of linalool per ha. from *A. balchanorum* is about 20 times that from coriander. In central and southern Moldavia *A. balchanorum* produces a crop ranging from 45 to 85 centners fresh weight per ha. At bud formation the essential oil content was 0.929-1.795% of the dry weight in the first year and 1.518% in the second year. March proved the best month for sowing.

4063. SAPKO, D. D.

The prospects of cultivating *Chenopodium ambrosioides* in the U.S.S.R. [Russian.]
Med. Prom-st' SSSR, 1957, No. 5, pp. 35-40, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,867.

In Moldavia 1 ha. of chenopodium yields 121.6 kg. of essential oil. The most economically valuable type was found to be *C. ambrosioides* var. *seratina*, especially selections Nos. 7, 25, 54, 29, 31, 57, 34, 52, 35, 21 and 11.

4064. ALVES, A. C., AND PRISTA, L. N.

Estudo farmacognóstico de cascas de *Cinnamomum cassia* (Nees) Nees ex Blume de S. Tomé. (**Pharmacological study of barks of *Cinnamomum cassia* from São Tomé.**)

Garcia de Orta, 1959, 7: 325-30, bibl. 6, illus.

Anatomical characteristics of the bark and preparation of the essential oil are described. The oil contained 82.9% of cinnamic aldehyde, but differed from that obtained from other sources (mainly *C. zeylanicum*).

4065. M—, W.S., AND P—, G.B.

***Cymbopogon afronardus* oil from Uganda.**

Trop. Sci., 1959, 1: 216-18, bibl. 2.

Analytical constants are given and compared with those of Kenya oil.

4066. MASLOVA, T. A., AND AZAREVIČ, O. I.

Oil-rich geraniums. [Russian.]

Tr. Vses. n.-i. In-ta sint. i natur. dušist. Veščestv, 1957, No. 3, pp. 78-88, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,878.

To develop geraniums with improved yields and oil contents the origin of the rose geranium had to be found and the heredity of the chemical characteristics in the hybrids traced. The progeny of inbred rose geraniums produced many heterogeneous forms, amongst which were types resembling *Pelargonium radula*, *P. capitatum* and *P. graveolens*, thus confirming that the cultivated rose geranium is a hybrid. In developing forms with an oil high in citronellol very good results were obtained by crossing *P. roseum* and *P. radula*. This gave rise to 3 promising hybrids, from which clones 1, 4 and 17 with high essential oil contents were selected. Spraying the mother plants with 0.05-0.1% heteroauxin improved the rooting of cuttings.

4067. BUJKO, R. A.

The biology of elecampane (*Inula helenium*) and the accumulation of essential oil in it. [Russian.]

Bot. Žurnal, 1959, 44: 1741-7, bibl. 29.

The average yield of roots of 2-year-old *I. helenium* grown without fertilizer was 656 g.; with NKP it was 819 g. and with NPK + Mn 1,027 g., the percentages of essential oil on a dry weight basis being 3.87, 4.11 and 4.39, respectively. Both root weight and essential oil content were greatest at

the end of the growth period. A comparison of topped with intact plants showed that, although the final essential oil content of the former was only slightly higher, it was attained some 15-20 days earlier.

4068. NIKOLAEV, A. G., AND RYSINA, M. N.

The essential oil of *Laserpitium hispidum*. [Russian.]

Uč. Zap. Kišinevsk. Un-t, 1957, No. 28, pp. 99-106, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,586.

The mature fruits of *L. hispidum* grown in Moldavia contain 2-8% of essential oil, of which 62% is geraniol.

4069. FÉRON, M., GUENNELON, G., AND AUDEMARD, H.

Technique de traitement contre la cécidomyie des lavandes (*Thomasiniana lavandulae* Barnes) et résultats obtenus. (**The technique of treatment against the lavender cecidomyid *T. lavandulae* and the results obtained.**)

Phytiat.-Phytopharm., 1959, 8: 27-31, bibl. 1, illus.

DDT powder containing 10% active ingredient reduced attacks from 53% to 8% on lavandin and from 63% to 5% on true lavender. Investigations described were concerned with the most effective stage in the life cycle at which to apply the insecticide and the technique of application by a special nozzle which delivers the insecticide at the base of the clumps.—*Stat. Zool. agric.*, Cent. Rech. agron. Sud-Est., Montfavet.

4070. KOLPAKOVA, O. I.

First studies of medicinal mints in Apšeron. [Russian.]

Izv. Akad. Nauk AzerbSSR, Ser. biol., 1959, No. 6, pp. 59-63, bibl. 8.

Of 7 mint varieties the Chinese 541 and Variety 6-30 had the highest essential oil contents.

4071. TANEV, I.

Mint mite (*Eriophyes mentharius*), a new and dangerous mint pest. [Bulgarian.]

Bull. Plant Prot., Sofia, 1957 (issued 1958), 6(3): 68-74, illus.

Noted for the first time in 1955 *E. mentharius* appears to have spread extremely rapidly and to have caused considerable damage to peppermint crops. An infested field should not be replanted with mint for 3 years. For control it is recommended to spray with Systox in the spring, 3 applications at intervals of 10-12 days being necessary.

Fibres.

(See also 3164, 3701, 4376, 4377, 4395-4399, 4616.)

4072. GARCIA, A. C.

Procedures for sampling and tensile strength testing of different kinds of fibers.

Philipp. J. Agric., 1956 (issued 1959), 21: 111-19, bibl. 13, illus.

Including a description and illustration of the "Louis Schopper" tensile strength testing machine.

4073. LIMBERK, J.

The influence of photoperiodicity on the sexual index in hemp (*Cannabis sativa* L.). [English, with Czech and Russian summaries $\frac{1}{2}$ and $\frac{1}{4}$ p.]

Biol. Plant., Prague, 1959, **1**: 176-86, bibl. 13, illus.

When hemp plants were sown at intervals from November to August, male plants usually flowered earlier than female. In April, when the day length exceeded 14 hours, the female plants ceased to flower and continued vegetative growth, but began to flower again in August when the day length had dropped to about 15 hours. Male plants flowered during even the longest days. A reduction in the light intensity by shading increased the proportion of female plants, particularly if the shading was imposed in the 2-3 weeks after germination. Intersexual plants were observed only during the short-day (11-13 hr.) period.—Czech. Acad. Sci., Prague.

4074. HESLÖP-HARRISON, Y., AND WOODS, I.

Temperature-induced meristic and other variation in *Cannabis sativa*.

J. Linn. Soc. (Bot.), 1959, **56**: 290-3, bibl. 5, illus.

When photoperiods inducing rapid flowering were combined with low night temperatures a high proportion of the flowers were intersexual. Intersexuality in male flowers involved a transformation of stamens to carpellate or intermediate structures.—Queen's Univ., Belfast.

4075. FERENCZY, L., GRACZA, L., AND JAKOBEY, I.
An antibacterial preparatum from hemp (*Cannabis sativa* L.).

Naturwissenschaften, 1958, **45**: 188, bibl. 5.

Extracted from the resinous organs of hemp.

4076. RABINOVICH, A. S., AJZENMAN, B. E., AND ZELEPUHA, S. I.

The isolation and study of anti-microbial substances from wild hemp (*Cannabis ruderalis*), growing in the Ukraine. [Ukrainian, with Russian summary $\frac{1}{2}$ p.]

J. Microbiol., Kiev, 1959, **21**(2): 40-8, bibl. 32.

Dry leaves and tops of *C. ruderalis* yield 0.1% of essential oil (1:50,000 to 1:100,000 activity), 0.002% of alkaloids (activity up to 1:40,000) and 0.5% of a complex of acids. The latter constitute the main anti-bacterial compounds in wild hemp.

4077. SEALE, C. C., AND ALLISON, R. V.

Strength and fineness of ramie fiber.

Proc. Soil Crop Sci. Soc. Fla, 1958, **18**: 300-5, bibl. 12.

Results of varietal tests.

4078. ALLISON, R. V., AND RANDOLPH, J. W.

Harvesting and processing ramie in preparation for industrial use.

Proc. Soil Crop Sci. Soc. Fla, 1958, **18**: 306-12, illus.

Historical survey.

4079. WILSON, F. D., AND PATE, J. B.

Improvement of sansevieria as a fiber crop through interspecific hybridization.

FISHLER, D. W., AND PATE, J. B.

Sansevieria, a potential fiber crop.

Proc. Soil Crop Sci. Soc. Fla, 1958, **18**: 279-83, bibl. 7, and 284-7, bibl. 10.

Promising hybrids obtained from *Sansevieria trifasciata* $\times$ *S. deserti*.

4080. HELLWIG, R. E., AND BYROM, M. H.

Harvesting and decorticating sansevieria.

Proc. Soil Crop Sci. Soc. Fla, 1958, **18**: 291-4, bibl. 7.

Factors in the development of practical harvesters and decorticators for sansevieria are discussed, and the production of a combined machine for field operation is envisaged.—U.S.D.A., Belle Glade, Fla.

4081. HOLMAN, B. T.

Sisal and henequen—world production and supply.

Proc. Soil Crop Sci. Soc. Fla, 1958, **18**: 259-64.

Historical survey.

4082. JOYNER, J. F., AND SEALE, C. C.

Hard fiber investigations in Florida.

Proc. Soil Crop Sci. Soc. Fla, 1958, **18**: 271-5, bibl. 9.

In experiments with 2 varieties of *Agave sisalana* and with *A. fourcroydes*, *Furcraea gigantea* and *F. cabuya*, henequen gave the highest yield of fibre, the 2 sisals came next and the furcraeas last. The sisals showed the greatest tensile strength and shear but the least wear and flex, in which qualities henequen came first. [See also *H.A.*, 30: 2505.]—Everglades Exp. Stat., Belle Glade, Fla.

Hops.

(See also 4610, 4622.)

4083. TRUCCO PADIN, E. L.

El lupulo. (The hop.)

Publ. Inst. Producción Univ. B. Aires **57**, 1959, pp. 117, bibls in text.

Among the subjects discussed are the hop-growing districts of Argentina, climatic and soil requirements, pests and diseases, breeding and selection, preparation of soil, spacing (plants 1.4-1.5 m. apart in lines 1.5-1.6 m. apart), planting (in spring of cuttings 10-12 cm. long with 2-4 eyes taken during the spring pruning from the subterranean part of the bine, and of rooted bine cuttings in the autumn), posts and strings, spring pruning and harvesting.

4084. ZATTLER, F.

Versuchs- und Forschungstätigkeit auf dem Hopfenversuchsgut Hüll und in den Anbaugebieten im Jahre 1958. (**Annual Report of the Experimental Hop Farm at Hüll for 1958.**)

Hopfen Rundschau, 1959, **10**: 193-8, 209-19, 229-33, 249-52, bibl. 10, illus.

The work described was carried out in cooperation with the Bavarian Institute of Plant Husbandry and Plant Protection and concerned the following, among other, subjects: *Cone dieback (Doldensterben)*: Further experiments involving ringing, foliar nutrition and other techniques demonstrated the physiological nature of the disease. The trouble was shown to be due to a lack of assimilates in relation to mineral salts. Close planting and excessive manuring should, therefore, be avoided. *Verticillium albo-atrum*: Transmission in the field never occurred *via* the aerial parts of the plant but always *via* wounded roots. The admixture of peat to the soil, both in containers and in the field, promoted root growth and reduced the incidence of the disease. Inoculation experiments showed that the period of susceptibility in hop plants extends from early growth to the beginning of cone formation. Certain weeds were shown to aid the spread of the disease. So far, none of the many chemicals tested has shown any promise of controlling *Verticillium* wilt, with the exception of Vapam which will be studied more thoroughly. *Nematodes*: Investigations are in progress on several aspects of this problem. *Cnephiasia wahlbomiana*: Chemical and biological control methods are being studied. *Gall midges on the cones*: There are indications that soil treatment with insecticides may give control. *Boron manuring*: Applications of 20 mg. and more per 1 kg. air-dry soil caused injury. *Breeding and variety trials* are also described.

4085. JONES, E. L., AND MOSS, N.

Rosemaund Experimental Husbandry Farm. Report on the experimental work on hops.

Minist. Agric., Lond., 1959, pp. 60, also separate summary of the above Report, pp. 6.

All the data in this report are based on 5 years' work.* With planting distances of $7\frac{1}{4} \times 3\frac{1}{2}$ ft. the yields of green and dry hops were not substantially different from those with $7\frac{1}{4} \times 7$ ft. spacing, the number of bines per stock being 4 in the first, and 8 in the second method. The cessation of deep cultivation at different stages from the initial spring ploughing until cone formation did not affect the date of cone formation or the yield of hops. In manurial experiments involving 4 levels of N, 2 of P, 4 of K and 2 of Mg, annual applications of mineral N above 80 lb./acre consistently reduced yields, the soil having also received a dressing of organic N as shoddy in every treatment. An average yield increase of slightly above 10%

resulted from applying 250 lb. of P_2O_5 per acre, and increases from K_2O were 1.5% for 100 lb./acre and 5.5% for 200 lb./acre, with no further response at 300 lb./acre. Yields were unaffected or depressed by Mg at 100 lb./acre. The leaf-P content was steadily increased by P manuring, and the leaf-N content began to increase in the 4th year in response to N application, though it was generally reduced by P applications. Increases in leaf K reflected those in applied K, and N application also increased leaf K, but P and Mg decreased it. Leaf Mg responded positively to applications of Mg or P, and negatively to K. Increasing N applications also tended to depress leaf Mg. Dressing the stocks in mid-April gave yields averaging 14% lower than the combined average from late November, late February and late March dressing, the last being the most favourable. The ratio of yields from the selection of weak, medium and strong bines was 10:11:11.4. Yields were unaffected by postponing the cutting away of the bines from the end of harvesting until late October, and by the extent of stripping of the lower leaves and lateral shoots from 6 in. to 5 ft. in 1 or 2 operations during growth. The results of trials with 13 new hop varieties bred at Wye are tabulated and discussed.

4086. VENT, L.

Nové poznatky chmelařského výzkumu. (**New considerations in hop research.**) [French, Russian and German summaries $\frac{3}{4}$ p. each.] *Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba*, 1959, **32**: 873-88, illus.

The work at the Hop Research Institute, Žatec, is concerned with the improvement of existing varieties, the selection of medium late, resistant varieties, increase in yield by fertilizers, control of diseases and pests, mechanization of picking, methods of drying and kiln design and the biochemistry of the cones.

4087. ZELENKA, V., AND LIBICH, V.

K otázce specializace chmelařských hospodářství. (Předběžné sdělení.) (**The problem of specialization in hop farming. (Preliminary communication.)**) [Russian and German summaries 2 $\frac{1}{2}$ pp. each.] *Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba*, 1959, **32**: 1011-40, illus.

Economic considerations.

4088. ZAJÍČEK, E.

Mechanizace zpracování půdy ve chmelnicích. (Předběžná zpráva.) (**The mechanization of soil cultivation in hop gardens. (Preliminary communication.)**) [French and Russian summaries $\frac{1}{2}$ p. each.] *Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba*, 1959, **32**: 989-94, illus.

Field trials of tractor-drawn ploughs.

4089. VANĚK, V.
Jde o rychlou a spolehlivou stavbu konstrukcí. (**Rapid and reliable methods of erecting hop poles and wire.**)
Chmelařství, 1959, 32: 11-12, 26-7, 44-5 and 59-60, illus.
An illustrated description of the tools, pulleys, etc., used in Czechoslovakia.
4090. MENERET, G., AND DE SAINT-MICHEL, A.
Les houblons de la récolte 1958. (**The hops of the 1958 crop.**)
Reprinted from *Brasserie*, 1959, No. 153, pp. 12.
Chemical composition and quality of 32 different hop varieties in Alsace, Burgundy and Flanders.
4091. POKORNÝ, M., AND KOSTELNÍK, J.
Výsledky pokusů o vlivu vzdálenosti a počtu vedených rév na výnos a jakost chmele v letech 1955-1958. (**Results of experiments on the effect of spacing and number of bines on the yield and quality of hops in 1955-1958.**) [Russian and German summaries 1 p. each.]
Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1959, 32: 889-910, bibl. 12, illus.
Six spacings with various numbers of bines per plant were compared with the standard spacing of 150 × 150 cm. with 2 bines on 1 string per plant. The most suitable number of plants per ha. was 3,000-4,000 with a total of 12,000-15,000 bines, and the optimum planting distance 110-150 cm. apart in rows 210-240 cm. apart. The average growth increment declined with increasing number of bines. A method of training that provided 4-6 bines per plant produced shorter and sturdier internodes, better adapted for machine picking than did 2 bines per plant. At a height of 4-6 m. multiple bine training produced more internodes and more cone-bearing laterals. The highest yields, from 15,000 bines per ha., were 56.3% greater than those produced with the standard 8,888 bines per ha.
4092. HAUTKE, P.
Vliv diferenčních dávek dusíku na výnos a kvalitu chmele. (**The effect of different rates of nitrogen on the yield and quality of hops.**) [Russian and German summaries ½ p. each.]
Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1959, 32: 911-28, bibl. 9.
Vliv dusíku na výnos a kvalitu chmele. (**The effect of nitrogen on the yield and quality of hops.**)
Chmelařství, 1959, 32: 43-4.
The amount of N applied was varied from 60 to 180 kg. per ha., but, whereas the N level in the leaves increased as the rate of N application was raised, the yield obtained with 60 kg./ha. was as great as that obtained with 180 kg./ha. At the normal harvest time the humulone content of the cones at the top of the bines was reduced by all treatments. When, however, picking was delayed by 4 weeks the top cones had a very high humulone content of 9.7%, which was almost equal to that of lupulone. Other constituents and the physical characteristics and commercial value of the cones were not affected by the treatments.
4093. ZAJÍČEK, E.
Hnojení plynným čpavkem ve chmelnicích. (**Manuring of hop gardens with anhydrous ammonia.**)
Chmelařství, 1959, 32: 139-40, illus.
Preliminary trials with anhydrous ammonia applied at 10 to 60 kg./ha. to a depth of 10-12 cm. by tractor equipment.
4094. HAUTKE, P., AND FIALA, V.
Škodlivost kysličníku siřičitého na chmel. (**The harmfulness of sulphur dioxide to hops.**)
Chmelařství, 1959, 32: 184-5, illus.
Symptoms of SO₂ injury on young hop plants are described. Earlier results [not given here] indicated that atmospheric SO₂ reduced the brewing quality of cones by decreasing the humulone content.
4095. ZÄTTLER, F.
Über eine Blattbräunung und Blattrollung beim Hopfen im Juni 1958. (**On leaf brown-ing and leaf roll in hops in June 1958.**)
Hopfen Rundschau, 1958, 10: 3-8, 19-25, illus.
Symptoms of, and investigations on, a disorder shown to be due to cold injury.
4096. BORN, M.
Beobachtungen über das Auftreten von Hopfenkrankheiten und-schädlingen in den Jahren 1957 und 1958. (**Observations on the incidence of hop diseases and pests [in East Germany] in 1957 and 1958.**)
Reprinted from *Dtsch. Landw.*, 1959, No. 12, pp. 3, bibl. 11, illus.
4097. KŘÍŽ, J.
Přenos kadeřavosti a nakažlivé neplodnosti chmele na potomstvo semenem. (**Seed transmission of curl and infectious sterility of hops.**) [Russian and German summaries ¾ p. each.]
Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1959, 32: 951-70, bibl. 8, illus.
Both virus diseases are seed transmissible and infectious sterility is also transmitted by pollen. The infection of either parent did not substantially reduce seed germination. Morphological symptoms of both diseases appeared in the early seedling stage on the first pair of true leaves. While infectious sterility was transmitted to 80-100% of the seedlings, curl was transmitted to only 10%. An increase in intensity of symptoms of infectious

sterility was accompanied by an increase in susceptibility of the plants to downy mildew. Both diseases appeared on the seedlings, even when symptoms of sterility on the mother plant were indistinct and curl was present only in a latent condition.

4098. POZDĚNA, J., KŘÍŽ, J., AND ČECH, M.
Vztahy některých faktorů ovlivňujících efektivnost mechanického přenosu nakažlivé neplodnosti chmele (*Humulus lupulus* L.). (The relationship between various factors affecting the mechanical transmission of infectious sterility in hops.) [Russian and German summaries $\frac{3}{4}$ p. each.] *Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba*, 1959, 32: 971-88, bibl. 23, illus.

Mainly about technique and symptoms [see also H.A., 28: 1672].

4099. PETRLÍK, Z., AND ŠTYS, Z.
Organické fungicidy v ochraně chmele. (Organic fungicides in hop protection.) *Chmelářství*, 1959, 32: 92-4, illus.

Four organic fungicides were compared with the standard Kuprikol spray for downy mildew control. Disease incidence on the leaves was reduced most effectively by Kuprikol and on the cones by zineb followed closely by Kuprikol. All the organic materials improved the colour of the cones.

4100. PETRLÍK, Z.
Zkušební z použití fungicidních poprachů v ochraně chmele před perenosporou. (Experiments with fungicidal dusts for the protection of hops against downy mildew.) [Russian and German summaries 1 p. each.] *Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba*, 1959, 32: 929-40, bibl. 10, illus.
PETRLÍK, Z., AND ŠTYS, Z.
Měďnaté poprachy—jejich použití a účinnost. (Copper dusts—their use and effectiveness.) *Chmelářství*, 1959, 32: 102-3, illus.

From results of 4 years' work with several copper fungicides, applied to hops from the ground and from the air at 40-45 kg./ha., it is concluded that dusting alone does not afford sufficient protection against *Pseudoperonospora humuli*. Dusting proved of value, however, as a supplement to spraying, especially in wet seasons.

4101. STANĚK, M., AND OTHERS.
První pokusy s použitím antifungálních antibiotik fungicidinu a aktidionu proti perenospoře chmelové. (Initial trials of the antifungal antibiotics Fungicidin and Actidione against hop downy mildew.) [Russian and German summaries $\frac{1}{2}$ p. each.] *Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba*, 1959, 32: 941-50, bibl. 13, illus.

Fungicidin at 0.1-0.2% and Actidione at 0.00125-0.005% effectively controlled downy mildew on artificially infected laterals, but the latter compound was phytotoxic. In field tests 1% Kuprikol gave better results than the antibiotics. The antibiotics also retarded *Fusarium* development on detached leaves and cones.

4102. PETRLÍK, Z., AND ŠTYS, Z.
Zkušenosti s leteckým postřikem proti perenospoře. (Experiments with aeroplane spraying against [hop] downy mildew.) *Chmelářství*, 1959, 32: 74-5, illus.

Inadequate control with 2% Grünkuper and 3% Kuprikol, each at 600 l./ha.

4103. CVETKOV, D.
Uncommon and little known pests observed on hops in Bulgaria. [Bulgarian.] *Bull. Plant Prot., Sofia*, 1957 (issued 1958), 6(3): 44-7.

Of the 22 pests recorded on hops in Bulgaria 11 are of uncommon occurrence, but have been observed on occasion to spread very rapidly. Dusting and spraying with DDT and parathion have given good results in controlling all 11 pests. These 2 compounds, however, were ineffective against the caterpillars of *Pyrausta nubilalis*, *Gracilaria fidella* and *Heliothis armigera*.

4104. KLOSTERMEYER, E. C., AND SKOTLAND, C. B.
Pesticide chemicals as a factor in hop die-out. *Stats Circ. Wash. St. agric. Exp. Stats* 362, 1959, pp. 11, bibl. 4, illus.

Heptachlor proved to be highly toxic to hops, destroying the root tissue of established plants and preventing cuttings from forming root systems. No recommendations can be made for correcting the soil toxicity caused by heptachlor, which is very persistent, especially in light, sandy soils, although applications of manure, cover crops or shredded hop bines may be beneficial. The affected area should be planted with crops other than hops. Experiments are in progress to determine the minimum injurious level of heptachlor.

4105. HUPFAUER, M.
Hop harvesting machines. *Agric. Engng St. Joseph, Mich.*, 1959, 40: 746-8, 750.

Seven different machines in use in West Germany are compared as regards output and amount of labour required, the quality of the harvested product, the amount of spoilage and the cost.

4106. HUPFAUER, M.
Vergleichende Untersuchungen an Hopfenpflückmaschinen. (Comparative studies of hop picking machines.) *Hopfen Rundschau*, 1959, 10: 97-107, 130-4, 179-84, illus.

The machines compared in detail were the Allaey's,

Bruff and Rotobank. Data are presented on performance, effect of mechanical picking on quality and other relevant items, but no definite conclusions are reached, except that more research is needed to perfect existing machines. It is suggested that the weight of green hops picked per hour should serve as a basis for comparison.

4107. DREXLER, O.

Sušení a skladování chmele. (**Hop drying and storage.**) [French and Russian summaries $\frac{1}{2}$ p. each.]

Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1959, 32: 995-1004, bibl. 1, illus.

Results are summarized of investigations carried out over 3 seasons in commercial kilns. Hops dried to an initial moisture content of 4-5%, rising in 14 days to 12-13%, retained their quality in storage better than those dried to about 8% moisture.

4108. STRACH, L., AND SRBEK, A.

Laboratorní pokusy se sušením chmele. (**Laboratory experiments on hop drying.**)

Chmelářství, 1959, 32: 56-7, bibl. 4, illus.

Samples of hops were dried electrically at temperatures ranging from 40 to 70° C. and with air flow speeds varying from 0.1 to 0.7 m./s. Increase of temperature was the main factor in accelerating drying; at an air speed of 0.3 m./s. raising the temperature from 40 to 70° C. shortened the time required to reduce the moisture content from 78% to 11.5% by 65%. Increasing the air flow from 0.1 to 0.7 m./s. reduced the time taken for drying at 50° C. by only 5%. The rise in the temperature of the cones was roughly exponential, 50% of the total rise being attained within 44 to 122 minutes of the start of drying. Considerable variations in brewing quality occurred but could not be attributed to the alterations in the drying conditions.

4109. KIENINGER, H.

Investigations on a new hop kiln in Hallertau. [German?]

Brauwelt, 1959, pp. 1342-7, from abstr. in *J. Inst. Brew.*, 1959, 65: 523.

During the 1958 hop-picking season a kiln was brought into operation which differed in essential points from conventional kilns. In order to prevent the sweating of hops on the upper floors of multifloor kilns, the process was re-arranged so that the hops were at first reduced to 50-60% moisture content on a withering floor and then transferred to the drying floor where the moisture was finally reduced to about 10%. With conventional kilns the driest and warmest air comes in contact with the driest hops. The withering kiln consists of a single independently-heated, horizontally-retractable floor with a tipping device which allows the air-dried hops to be quickly

off-loaded. The drying kiln is a 4-tiered construction. The 3 upper floors can be tipped and the lower floor can be withdrawn, raised and its hop load tipped on to the dried hop floor. Mechanical handling at all stages minimizes damage to the cones. Hops can be dried to 6-10% moisture content in 7 hours. The inlet air temperature to both kilns is 57° C.; the exit air temperature of the withering kiln is about 38° C. and that of the drying kiln 50° C. A Wöllmer analysis of fresh cones and of cones dried at 55-57° C. showed no significant difference in quality.

4110. WELLHOENER, H. J., AND IRRGANG, G.

Rapid determination of the bitter constituents of hops. [German?]

Brauwelt, 1959, pp. 1417-19, from abstr. in *J. Inst. Brewing*, 1960, 66: 69.

For the measurement of the α -acid content the determination of the conductivity of the benzene extract can be performed in 20 min. and shows deviations of less than 0.1% from the much slower gravimetric method.

4111. HUDSON, J. R.

Evaluation of hops. VIII. Note on the preparation of extracts in the estimation of α acids.

HOWARD, G. A., AND STEVENS, R.

Idem. IX. Flavour of hop oil constituents.

J. Inst. Brew., 1959, 65: 422-3, bibl. 2, and 494-6, bibl. 8.

For part VII see *H.A.*, 28: 1652.

4112. PETŘÍČEK, D.

Změny hořkých látek a chmelových tříslovin během zrání a skladování chmele. (**Changes in hop bitter substances and tannins during ripening and storage.**) [French, German and Russian summaries $\frac{1}{2}$ p. each.]

Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1959, 32: 1005-10, bibl. 2.

The α -acid content was found to reach a maximum during the first half of September, and picking earlier than this reduced both the quality and quantity of the crop. Sulphur dioxide treatment reduced the loss of bitter principles during storage. Of 2 varieties compared Clone 72 stored better than Clone 126.

4113. JACKSON, C. P., AND WALKER, T. K.

Studies on the delta resin of hops. I. Isolation and preliminary fractionation of δ resin and some observations respecting its nature and composition.

J. Inst. Brew., 1959, 65: 497-503, bibl. 10.

4114. KUROIWA, Y., AND KOKUBO, E.

Determination of δ resin of hops.

Rep. Res. Lab. Kirin Brewery Co., Yokohama, 1958, No. 1, pp. 13-18, from abstr. in *J. Inst. Brew.*, 1959, 65: 512.

In a comparison of 2 methods of determination an ultra-violet spectrophotometric method was found to give slightly higher values than a gravimetric one, but it was rapid and suitable for routine use. When hops were stored at 5-6° C. and at 30° C., in air and in nitrogen, the δ resin increased in all cases, though the increase was less under anaerobic conditions and at low temperatures.

4115. BROWN, P. M., AND HOWARD, G. A.
Chemistry of hop constituents. Part XIV. 2,4-Diacetyl-3,4-dihydroxy-5-methylcyclopent-2-enone, an analogue of isohumulone A.
J. chem. Soc. Lond., 1960, pp. 164-6, bibl. 10.
This analogue lacks the bitter taste and bacteriostatic power of isohumulone A. [Part XIII was noted in *H.A.*, 29: 2710b.]

4116. HOWARD, G. A., AND SLATER, C. A.
The nature of hop oil and its importance in brewing.
Brewer's Guild J., 1958, **44**: 409-18, from abstr. in *Wallerstein Lab. Commun.*, 1959, **22**: 344.

Column and gas chromatography has shown hop oil to contain at least 45 compounds, nearly half of them hydrocarbons, the rest largely esters. Studies on certain new hybrid hops indicated that some characteristic flavours could be traced to sesquiterpenes, which were also associated with the flavour of dry-hopped beers.

4117. KOTRLÁ-HAPALOVÁ, M., AND SOUDEK, J.
Hop tannins, their significance and colorimetric determination.
From *Brauwissenschaft*, 1958, **11**: 231, from abstr. in *Wallerstein Lab. Commun.*, 1959, **22**: 344-5.

Comparison of de Clerck's colorimetric method with the methods of Chapman, Hartong and Stadnik.

Insecticidal plants.

(See also 4616.)

4118. FISJUN, V. V.
The growing conditions of *Anabasis aphylla* in some regions of the South-Kazakhstan province. [Russian.]
Tr. In-ta Bot. AN KazSSR, 1957, **5**: 270-83, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,588.

The main source of anabasine sulphate.

4119. ANON.
La rotenone. (Rotenone.)
Bull. belgo-brésilien, 1959, **34**: 288-9, from *Trop. Abstr.*, 1960, **15**, Abstr. h450.

The cultivation of *Lonchocarpus nicou*, timbó blanc, in Brazil is described. The roots are

harvested in the dry season, shade dried and then oven dried at a temperature not exceeding 75° C. until the moisture content drops to 6-7%. The rotenone content of the crop is 15 to 17%. One hectare of 3,000 plants yields 6,000 kg. of fresh roots, which dry down to 2,800 kg. containing 1,000 kg. of rotenone.

Plant sources of antibiotics.

(See also 3729, 4075, 4076, 4177.)

4120. NICKELL, L. G.
Antimicrobial activity of vascular plants.
Econ. Bot., 1959, **13**: 281-318, bibl. 174.
Plants from 157 families are listed showing type of activity, type of extract and the plant part tested. A second, very long list names the plants tested which showed no activity.

4121. FERENCZY, L., AND GRACZA, L.
Antibacterial substances in leaves of dried plants.
Naturwissenschaften, 1957, **44**: 590-1, bibl. 3.
Positive results were obtained with 28 out of 442 species examined.

4122. PETRUŠOVA, N. I.
The fungicidal properties of higher plants. [Russian, with German summary.]
Bjull. nauč.-tehn. Inf. gos. Nikitsk. bot. Sad, 1957, No. 2, pp. 41-6, from *Ref. Ž. (Biol.)*, 1958, No. 18, Abstr. 82,589.
Of 1,281 species examined 1,237 possessed properties with various degrees of fungicidal activity.

4123. MASILUŃGAN, V. A., AND OTHERS.
The antimicrobial activity of extracts from acacia leaves.
Philipp. J. Sci., 1958, **87**: 7-14, bibl. 8.
Methods of preparing extracts from "*acacia*" (*Samanea saman*) leaves and their activity against *Mycobacterium tuberculosis* and other bacteria.

4124. SLAVÉNAS, J.
Sinapis alba ir *Brassica juncea* fitoncidų practinio parandojimo klausimo. (On the question of practical use of the phytoncides of *S. alba* and *B. juncea*.) (Lithuanian, with Russian summary 1 p.)
Darb. Akad. Moks. LietTSR, Ser. B, 1958, **2**(14): 183-96, bibl. 33.

The maximum content of phytoncidal substances occurs in *S. alba* at the pod formation stage, and in Chinese mustard (*B. juncea*) at flowering. Distillates from the seeds of *B. juncea* checked the growth and sporulation of many fungi, but those of *S. alba* had a negligible effect. Higher concentrations of the phytoncides had an inhibitory effect on the germination of various seeds including peas. Chinese mustard oil cake was also an effective inhibitor of pathogens.

4125. SLAVÉNAS, J.

Apie kai kurias *Sinapis alba* ir *Brassica juncea* fitoncidų savybes. (Some properties of the phytoncides from *S. alba* and *B. juncea*.) [Lithuanian, with Russian summary $\frac{1}{2}$ p.] *Darb. Akad. Moks. LietSR, Ser. B*, 1959, 3(18): 163-71, bibl. 19.

In a further study of the phytoncidal properties of *S. alba* and *B. juncea* it was established that extracts from the 2 plants contain croton oil as well as the usual mustard oils. During storage distillates from *S. alba* lost their phytoncidal properties much more rapidly than those from *B. juncea*.

Rubber plants.

4126. JÍMENEZ AIZPURUA, A.

Cultivo del guayule y producción de caucho virgen. (Estudios de selección.) (Cultivation of guayule and production of virgin rubber.) *Montes, Madrid*, 1958, 14: 401-9, illus., from *Biol. Abstr., Sect. D*, 1959, 33, Abstr. 19,253.

Examination of 8 varieties of *Parthenium argentatum* showed that the rubber yield was closely related to the form and intensity of growth of the phloem and inversely to that of the xylem. High yielding individuals had thick stems and relatively low and abundant branching. Selection among the progeny of high yielding plants resulted in increased rubber yields. Moisture in the spring was found to favour vegetative growth, and a long dry period in the summer stimulated the accumulation of rubber. Plants grown in the shade were found to yield about half as much as those grown in full sunlight.

4127. ŠIKINA, A. P.

Changes in carbohydrates and nitrogenous compounds during growth of different forms of kok-saghyz. [Russian.] *Izv. Akad. Nauk KazSSR, Ser. Bot. Počvov.*, 1959, 1(4): 36-42, bibl. 16.

Marked increases in carbohydrate accumulation during the later stages of growth of kok-saghyz plants favour root formation and rubber synthesis. Tetraploid forms of kok-saghyz accumulated larger amounts of carbohydrates, and yielded more rubber, than diploid or haploid plants, but the latter responded better to fertilizer applications. Protein N declined during the later stages of growth.

Seed oils.

(See also 4376, 4377, 4616, 4633.)

4128. CANECCHIO, V. (FILHO), AND DE TELLA, R.

A cultura da mamoneira. (Castor bean cultivation.) *O Agrônomo*, 1959, 11(3-4): 9-15, illus., from *Trop. Abstr.*, 1960, 15, Abstr. h719.

Castor cultivation in Brazil is described, with

information on soils, maintenance, harvesting and processing. Variety 1A-38 is recommended [see also *H.A.*, 30: 949]; yields amount to 3,000 kg. per ha.

4129. THOMAS, C. A.

Permeability measurements of castor-bean seed indicative of cold-test performance. *Science*, 1960, 131: 1045-6, bibl. 5.

Experiments are described in which the conductivity and reducing-sugar content of water in which castor seeds had been steeped for 1 hour were found to be closely correlated with stand in a germination test under conditions favourable to pre-emergence damping-off. Conductivity thus provides a rapid means of predicting germination performance.—U.S.D.A., Beltsville, Md.

4130. MARCUS, A., AND VELASCO, J.

Enzymes of the glyoxylate cycle in germinating peanuts and castor beans. *J. biol. Chem.*, 1960, 235: 563-7, bibl. 25.

4131. MONTALVO, R.

Higuerilla. La poda en la variedad Chocolate. (The castor bean. Pruning the variety Chocolate.) *Bol. trim. Exp. agropec. P.C.E.A., Lima*, 1959, 8(4): 15-20, bibl. 2.

The variety Chocolate, grown in Peru, is a native perennial type of castor bean. It is larger than the annual American types and therefore more difficult to harvest, but has the advantage that the fruit is not dehiscent. If the plants are cut back, 2 months after sowing, to a height of 75 or 100 cm., the height at harvest time is not reduced but the yield of seed is increased. Pruning back to 50 cm., however, reduces both final height and seed yield and is therefore not recommended.—Estac. exp. agric. La Molina.

4132. GIRAL, F., AND MARIEL, R.

Composición de la grasa del colorín (*Erythrina americana* Mill.). Grasas vegetales. II. (Composition of the oil from *Erythrina americana*. Vegetable oils. II.) *Ciencia, Méx.*, 1959, 19: 27-8, bibl. 6.

From seeds of Mexican origin.

4133. NARAYANAN, S. S., SANKARAN, S., AND RAMABHADHAN, G.

Safflower, a suitable oil seed crop for black soils. *Madras agric. J.*, 1959, 46: 472-6, illus.

Sown in drills 18 in. apart at 10 lb. seed per acre in October–November the best strain of safflower (No. 852) produced yields of 300–500 lb./acre in February. The seeds contained 29% of oil. This crop is suited to low rainfall areas where ground-nuts fail. The spiny nature of the plant makes it useful as a hedge round other crops.—Agric. Res. Stat., Kovilpatti.

4134. POWELL, L. M.

Safflower variety adaptation trials in Wyoming.

Mim. Circ. Wyo agric. Exp. Stats **113**, 1959, pp. 6.

Seed and oil yields and iodine values tabulated for 8 varieties grown under irrigated and dry-land conditions.

4135. ARMOUR, R. P.

Investigations on *Simarouba glauca* Dc. in El Salvador.

Econ. Bot., 1959, **13**: 41-66, bibl. 27, illus.

A botanical description of this tree is given, together with details of its economic uses. The kernels produce 62% edible oil, of which the chemical composition is given, under commercial extraction procedures; the press cake can be used as cattle feed or fertilizer, and the timber is useful for local industries. Suitable soils and climate are described. There are 3 floral types, viz. pistillate, staminate and those with hermaphrodite and male flowers on the same tree. Vegetative propagation is therefore desirable and this may be done by grafting, cuttings and air-layering. These methods are described. Pests and diseases and their control are briefly described.

Tannin plants.

4136. SOKOLOV, P. D.

On the tannin content of some plants of Talyš. [Russian.]

Bot. Žurnal, 1959, **44**: 1328-33, bibl. 16.

The tannin contents are given of 7 woody and 8 herbaceous species growing in the Talyš district of Azerbajdzhan.

4137. PERVUHIN, F. S.

***Polygonum coriarium* Grig, a new tannin plant. [Russian.]**

Bot. Žurnal, 1959, **44**: 1282-3, illus.

Under cultivation 3-year-old *P. coriarium* plants yielded 9 tons per ha. dry weight of roots, which, with a 20% tannin content and 80% extraction, produced 1.44 tons of tannin.

4138. WATTLE RESEARCH INSTITUTE, PIETERMARITZBURG.

Report for 1958-1959, 1959, pp. 51, bibls, illus.

A review of work in progress includes the following: *Silviculture*: An experiment harvested at 9 years of age showed that frequent weeding may be a direct cause of gummosis, even though actual root injury was kept to a minimum by hand-pulling of weeds and wattle regrowth. The fact that hoed plots had significantly more gummosis than hand-weeded plots suggests that hoeing injury to the larger lateral roots may have been a contributory cause. For probably the same reason the trees of hoed plots had a lower mean diameter than those of hand-weeded plots. The bark and tannin yield of plots, in which weeding was confined to a single

operation when the seedlings were about 2 months old, did not differ significantly from that obtained from plots which were weeded 4 times. It should therefore be possible to effect a considerable saving in weeding costs. A study of winter temperatures at different altitudes above soil level and above different soil surfaces indicate that the removal of all surface cover from beneath and around wattle seedlings is likely to reduce frost injury. Moreover, some means of compacting the soil after cultivation may have to be sought in order to secure the maximum benefit of heat radiation. Shelterwood experiments suggest that the retention of about 100 trees per acre, when felling plantations, will provide sufficient cover to protect the resulting regeneration from serious frost damage. If the shelterwood trees can be stripped standing after the first winter, root competition will be obviated and the barrier to free radiation presented by the dead trees will give protection to the seedlings. A ley crop consisting of *Eragrostis curvula* showed distinct advantages over an arable crop, e.g. maize, in rotation with wattle. *Genetics and Plant breeding*: Information is given on interspecific hybrids, inbred lines, progeny testing (involving, among other things, artificial wounding to determine susceptibility to gummosis) and propagation by air-layers (with high temperatures as a possible cause of failure). In studies of the pollination mechanism it was found that the exclusion of large insects forms a fairly effective barrier to cross pollination. *Chemistry*: From fertilizer experiments it is concluded that about 2 cwt. of superphosphate per acre is the optimum economic application; other nutrients failed to give significant or economic responses. *Entomology*: Further studies have been made on aerial spraying for bagworm control and also on its biological control by the dissemination of a virus disease.

Sundry plants.

4139. TAMMES, P. M. L.

Micro- and macro-nutrients in sieve-tube sap of palms.

Acta bot. neerl., 1958, **7**: 233-4, bibl. 4.

Sap of *Arenga saccharifera* analysed; it is a source of jaggery.

4140. ARNOLD, E. L.

Pumping maple sap from tree to gathering tank.

Vt Fm Home Sci., 1958, **3**(3): 6-7, illus.

Using a vacuum line and a milking machine compressor.

4141. RAYMOND, W. D., AND SQUIRES, J.

Sources of starch in Colonial Territories, II: arrowroot (*Maranta arundinacea* Linn.).

Trop. Sci., 1959, **1**: 182-92, bibl. 15, illus.

A review covering cultivation, extraction, grading and marketing in St. Vincent and starch viscosity.

FLORICULTURE.

General.

(See also 3160, 3526, 3716, 4601, 4605, 4614, 4630.)

4142. ŠTERBAKOV, V. K.

Inducing polyploidy in ornamental plants. [Russian.]

Cvetovodstvo, 1959, 2(1): 16-17, illus.

Polyploidy was induced in many ornamental plants by treating dried seeds and young shoots with 0.1-0.25% colchicine. Soaking seeds for 4-6 hours resulted in 100% polyploidy in summer stocks and asparagus (*Asparagus officinalis*).

4143. HRISTOVA, E.

New diseases of ornamental plants in Bulgaria and their control. [Bulgarian.]

Ovoštarstvo i Gradinarstvo, 1958, No. 1, pp. 38-41, illus.

Against cyclamen wilt (*Fusarium oxysporum* var. *auranticum*), which has become epiphytotic in the last 3 years, the treatment of greenhouse soil and flower pots with 0.25% Germisan gave very satisfactory results. The incidence of *Verticillium albo-atrum*, causing wilt of cinerarias and chrysanthemums, and of *Coleosporium senecionis*, causing rust of cinerarias, was considerably reduced by dusting with sulphur when the symptoms first appeared. Leaf blotch (*Cladosporium paeoniae*) on peonies was successfully controlled by an application of 1% bordeaux mixture at the first appearance of the symptoms, but some varieties were scorched by the spray.

4144. PIEROH, E. A., WERRES, H., AND RASCHKE, K.
Trapex—ein neues Nematizid zur Bodenentseuchung. (Trapex—a new nematicide for soil sterilization.) [English summary 31 lines.]

Anz. Schädlingssk., 1959, 32: 183-9, bibl. 4.

Trapex is a trade name for methylisothiocyanate. Trapex kills not only free living eelworms and root-knot nematodes but also cysts of *Heterodera* species. It also controls *Rhizoctonia* and *Pythium* and exhibits herbicidal properties and kills soil insects. In experiments with stocks, begonias and cucumbers pre-planting treatment resulted not only in higher yields but also in improved quality. —Hauptlab. Schering AG, Berlin.

4145. ENGLISH, L. L.

Tedion for spider mite control [in greenhouses].

Ill. St. Flor. Ass. Bull., 1959, No. 198, p. 5.

A slurry of 1 lb. 25% w.p. per 200,000 cu. ft. of greenhouse should be painted on the steam pipes when they are cold. The steam, when turned on at night, sublimes the chemical which condenses on the foliage and kills eggs, larvae, small nymphs and resting stages. Adult mites are less susceptible, but, if the treatment is repeated weekly,

it reduces infestation considerably. [For earlier reports, see *H.A.*, 29: 2795.]

Annual and herbaceous plants.

(See also 3157, 3176, 3735, 4142-4144, 4607, 4613, 4621.)

4146. TITARENKO, E. E., AND KUZNECOVA, M. N.
Micro-elements improve flowering. [Russian.]

Cvetovodstvo, 1959, 2(5): 15, illus.

Stocks were sprayed 3 times, and chrysanthemums and pinks 5 times, with a dilute solution of boric acid and potassium permanganate at intervals of 10-20 days starting at bud formation. The treatments accelerated flowering and caused a marked increase in the number of flowers, amounting to 50% for stocks, 8.5% for chrysanthemums and 11% for pinks. With pinks the weight of the individual flowers was increased by 6-7%.

4147. MILLER, H. N.

Control of soil organisms causing damping-off and root rots of nursery plants.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 137-8.

Twelve fungicides were applied as soil drenches or seed treatments at the time of sowing annuals. Terraclor (pentachloronitrobenzene) and Terraclor-captan combinations, applied by either method, gave almost 100% control of damping-off caused by *Rhizoctonia* sp. Terraclor was ineffective against *Pythium* sp. Nabac (2,2-methylene bis, 3,4,6-trichlorophenol) gave excellent control when used as a soil drench. A single application of VC-13 and 3 applications of Nemagon at monthly intervals around nursery plants resulted in good growth responses and significant reductions in nematode populations.

4148. KERR, S. H., AND KUITERT, L. C.

Identity, biology and control of insect and arachnid pests of herbaceous ornamental plants.

A.R. Fla agric. Exp. Stats, 1957-58, p. 102.

The maximum concentrations of insecticides which appeared safe to use in 25 gal. of water per acre on flowering Easter lilies were: TEPP, $\frac{1}{2}$ pt. 40% emulsifiable concentrate; endrin 1 pt. 18% e.c.; parathion, $\frac{1}{2}$ pt. of 4 lb. per gal. e.c.; and malathion, 1 quart of 5 lb. per gal. e.c. To keep the buds and blooms of chrysanthemums free from chewing caterpillar injury 2 lb. of 50% DDT w.p. per 100 gal. had to be applied every other day.

4149. BÜNSOW, R., AND HARDER, R.

Blütenbildung von Adonis und Rudbeckia durch Gibberellin. (Flower formation in Adonis and Rudbeckia induced by gibberellin.) *Naturwissenschaften*, 1957, 44: 453-4, bibl. 5, illus.

In experiments with the facultative long-day plant *Adonis flammeus* and the long-day plants *Rudbeckia bicolor* and *R. hirta* flower formation was induced by the application of gibberellin in place of long-day treatment.—Pfl. Physiol. Inst., Univ. Göttingen.

4150. NAPP-ZINN, K.

Vernalisation, Licht und Alter bei *Arabidopsis thaliana* (L.) Heynh. I. Mitteilung. Licht und Dunkelheit während Kälte- und Wärmebehandlung. (Vernalization, light and age in *Arabidopsis thaliana*. I. Light and darkness during cold and heat treatment.) *Planta*, 1960, 50: 409-44, bibl. 21.

4151. MANTROVA, E. Z.

Fertilizers for asters. [Russian.] *Cvetovodstvo*, 1959, 2(3): 29, illus.

The best manurial treatment for asters, which produced strong plants with abundant bud formation and high quality flowers, was found to be an autumn application of decayed manure at 5-6 kg. per sq. m., followed by a pre-planting application of 45-60 g. sulphate of ammonia, 45-60 g. superphosphate and 15 g. potassium chloride per sq. m. Spraying the plants every 10 days with 0.02% KMnO_4 increased plant height and flower yields.

4152. HELLMERS, E.

Bestråling af nellikestiklinger, plantepatogene bakterier og svampe med gammastråler fra Cobolt⁶⁰. (The irradiation of carnation cuttings and of plant pathogenic bacteria and fungi with gamma rays from cobalt⁶⁰.) [English summary 20 lines.] *Horticultura*, 1959, 13: 201-4, bibl. 3.

The tolerance to gamma rays from CO^{60} of carnation cuttings and of 4 pathogenic organisms was determined. The results show that the fungi and bacteria concerned cannot be controlled by gamma rays without also killing the plants.

4153. HANAN, J. J.

Influence of day temperatures on growth and flowering of carnations.

Proc. Amer. Soc. hort. Sci., 1959, 74: 692-703, bibl. 13, illus.

Carnation plants were grown at day temperatures of 60, 65, 70 and 75°F., with a constant night temperature of 52°F. It was found that day temperature did not affect yield or increase in dry weight, but it did affect quality. The optimum temperature for quality decreased as the light intensity decreased and as the plants became older. In general, decreasing the temperature from 75° to 60° resulted in greater colour intensity and an increase in the fresh weight of cut flowers, flower size, internode length, leaf width and stem strength; flowering, however, was later, and there was a decrease in stem length, percentage of dry matter

in the stems and in the keeping life of the cut flowers.—Colo. St. Univ., Fort Collins.

4154. WHITE, H. E.

The effect of supplementary light on growth and earliness of flowering carnations.

From abstr. in *Ill. St. Flor. Ass. Bull.*, 1959, No. 199, p. 13.

Supplementary light induced Red Sim and Flamingo carnations to flower 30 days earlier and interrupted the normal crop harvest peaks. An effect of 2 night temperature treatments on the time of flowering was only obtained under supplementary light treatment. The latter had little effect on production and quality.—Univ. Mass., Amherst.

4155. GUSEJNOVA, M. M.

A malformation of carnation flowers. [Azerbajdzhan, with Russian summary 13 lines.]

Izv. Akad. Nauk AzerbSSR, Ser. biol., 1959, No. 6, pp. 41-2, illus.

Certain soil and climatic conditions in Apšeron caused a malformation of carnation flowers, in which scales were formed in the place of sepals and petals. These scales, about 70 per flower, grew on a central axis which replaced the pistil and stamens.

4156. ALLERTON, F. W.

Direct-planted chrysanthemums.

Comm. Gr., 1960, No. 3350, pp. 705-7, illus.

Soil texture is very important and substantial dressings of peat, and, in heavy soils, of grit should be given. Fertilizer application is seldom required following tomatoes or cucumbers. Planting of the just-rooted cuttings should be very shallow, and spacing at 9 by 8 in. for early and mid-season varieties, with soft pinching 2-3 weeks after planting, is recommended, but for planting after the 2nd week in August spacing at 6 by 5 in. with single stem culture is advisable. Earlier planted in March require very little heating, but later varieties require a temperature of about 60°F. March planted varieties suitable for flowering before July include Delightful, Golden Delightful and Milestone; June planted varieties for October-November flowering include White Swan and Sundown. Financially a whole-season routine with chrysanthemums pays at least as well as a 60-ton early tomato crop or a 2-2½-ton cucumber crop, and November-Christmas flowering varieties can be grown at a fraction of the labour cost of long-season pot culture.

4157. SCHWABE, W. W.

Some effects of environment and hormone treatment on reproductive morphogenesis in the chrysanthemum.

J. Linn. Soc. (Bot.), 1959, 56: 254-61, bibl. 9, illus.

Chilling was shown to affect the "true plastochron"

(the rate of initiation) of the vegetative apex, but a growth temperature in the range of 17° to 27°C. had no effect. The "apparent plastochron" (the rate of unfolding of new leaves), however, was affected by lower temperature, because the rate of unfolding of leaves did not keep pace with the rate of initiation. Factors affecting the change-over from the vegetative to the reproductive condition are summarized. A striking increase in the size of the apex itself was noted at the time of transition to the reproductive condition. This formation of the receptacle was apparently irreversible. The behaviour of the growing point, even after receptacle formation, was still subject to environmental control, particularly to changes in day length and light intensity. The effects are thought to act indirectly through a modification of the auxin metabolism of the plant.—Imperial Coll., Lond.

4158. OKADA, M.

On the rosetting of suckers and measures for breaking rosetting in chrysanthemums.
[Japanese, with English summary $\frac{1}{2}$ p.]

J. hort. Ass. Japan, 1959, 28: 209-20, bibl. 12, illus.

This study was made to obtain information on the development of suckers and on the factors responsible for rosette formation, and to find means of overcoming rosetting. When all the buds were pinched off or were checked by spraying with MH, suckers started to develop before flower bud differentiation, whereas under natural conditions suckers developed simultaneously with flower bud differentiation. Suckers developing in September or later formed rosettes, but those developing in July or August did not. The factors responsible for rosetting appeared to vary with the variety, since suckers of Shin-Tōa and Okayama-Heiwa were induced to form rosettes by low temperatures (15°C.) under long days, whereas with suckers of Pink-Tōa rosette formation occurred under short day conditions. Suckers of Shin-Tōa and Okayama-Heiwa grown in the open until December 20 and then moved into a greenhouse elongated well, showing that this low temperature period was sufficient to break the rosetting habit of their suckers. Ethylene chlorhydrin had some effect, but thiourea had no effect, on breaking rosetting. GA at 50 and 100 p.p.m. had no effect when applied at the early or late stage of rosetting but had a significant effect when applied at the middle stage.

4159. WOLTZ, S. S.

Nitrogen and potassium fertilization of chrysanthemums.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 318-19.

Leached Uramite produced significantly higher yields of pompon chrysanthemums than the unleached material, when both were applied

pre-planting at 6 lb. per 100 sq. ft. Liquid fertilizers were also tested, using ammonium nitrate and sulphate of potash to provide the equivalent of $\frac{1}{4}$, $\frac{1}{2}$ and 1 lb. of 25-0-25 fertilizer per 100 sq. ft. weekly. Yield and quality were better at the $\frac{1}{2}$ lb. than at the $\frac{1}{4}$ lb. rate, and yield, but not quality, was further improved by the 1 lb. rate. When the ratio was altered, lowering the N reduced yields in the autumn but not in the spring, whereas lowering the K reduced yields in both seasons. Increasing the N in the spring application significantly increased the incidence of leaf miner.

4160. CAIRNCROSS, G. T. (Editor)

The delphinium year book 1960.

Delphinium Society, London, 1960, 8 $\frac{1}{2}$ × 5 $\frac{1}{2}$ in., pp. 136, illus., 10s. or \$1.75.

Among articles of general interest is one by A. A. Samuelson on the scarlet flowered species *D. nudicaule* and *D. cardinale* and another by H. S. Hodson on the control of slugs and snails, mainly by baits containing metaldehyde. Scented delphiniums and true yellow delphiniums are discussed by N. Dain, and there are several notes on varieties, both old and new.

4161. JAIN, H. K., AND BOSE, A. K.

Experimentally induced inter-bivalent redistribution of chiasmata in *Delphinium*.

Nature, 1960, 186: 260-1, bibl. 4,

Induced by X-radiation of dry seeds.

4162. PAG, H.

Untersuchungen über das "Gerbera-Sterben".
(Studies on gerbera "death".) [English summary 7 lines.]

NachrBl. dtsh. PflSchDienst., Braunschweig, 1960, 12: 74-7, bibl. 21, illus.

Gerbera "death", which causes serious losses to growers in West Germany, was shown to be due to a soil-borne fungus, identified as *Phytophthora cryptogea*. At present control is confined to soil sterilization and other prophylactic measures. The symptoms of the disease are described and illustrated.—Lab. ZierpflKrankh., Berlin-Dahlem.

4163. SHARMA, B. B.

Plant disease in relation to nutrition. I. Effect of nitrogen, potassium and phosphorus in the leaf blight of hollyhock.

Curr. Sci., 1959, 28: 440-1, illus.

Increasing N nutrition increased the susceptibility of hollyhocks to *Alternaria tenuis*, whereas increasing P reduced it. The effect of K was intermediate.—Dep. Bot., Univ. Lucknow.

4164. HUGHES, A. P.

Effects of the environment on leaf development in *Impatiens parviflora* D.C.

J. Linn. Soc. (Bot.), 1959, 56: 161-5, bibl. 1, illus.

Anatomy of sun and shade leaves.

4165. SCHÜTTE, K. H.
Micro-nutrient deficiency and transpiration in *Tropaeolum majus* L.
J. exp. Bot., 1959, 10: 443-7, bibl. 9.
 Plants grown in water cultures deficient in B, Cu, Mn or Zn had lower transpiration rates than the controls grown in full nutrient solutions, the disparity being greater with more acute deficiency. The control plants were smaller, with fewer and smaller leaves than the deficient plants, and their foliage was greener and healthier in appearance.—Univ. Cape Town.
4166. SCHMELZER, K.
 Untersuchungen über das Ringmosaik-Virus der Kapuzinerkresse. (**Studies of the ring spot virus of nasturtium.**) [English summary $\frac{1}{2}$ p.]
Z. PflKrankh., 1960, 67: 193-210, bibl. 19, illus.
 Host range, vectors, symptoms and thermal inactivation point.
4167. OLISEVIČ, G. P.
Control of the phlox stem nematode. [Russian.]
Cvetovodstvo, 1959, 2(3): 29, illus.
 Very good control of *Ditylenchus floxidis*, infesting perennial phlox, was obtained with 3 applications, at 20-day intervals, of 0.5% Thiophos [parathion] applied at the rate of 250-300 c.c. per plant around the base of the plants.
4168. KOVALEVSKAJA, M. F.
Pre-sowing treatment of seeds of the Shabo pink. [Russian.]
Cvetovodstvo, 1959, 2(1): 13, bibl. 1.
 Seeds of the Shabo pink were soaked for 12 hours at 16-17°C., dried for 12 hours at 20°C. and then kept at -1° for 12 hours. The treated seeds germinated earlier, and the plants were 8.2-9 cm. taller, and produced 6-7 more flower buds per plant, than those from the untreated controls.
4169. VALENTINE, D. H., AND WOODDELL, S. R. J.
Seed incompatibility in *Primula*.
Nature, 1960, 185: 778-9, bibl. 7.
 Reciprocal diploid-autotetraploid crosses in several *Primula* species produce non-viable degenerate seed of 2 types. The same is true of a number of diploid interspecific crosses. The genetical implications are discussed.—Univs. Durham and Oxford.
4170. CUSICK, F.
Floral morphogenesis in *Primula bulleyana* Forrest.
J. Linn. Soc. (Bot.), 1959, 56: 262-9, bibl. 8, illus.
 A study based on surgical techniques and with apices marked with 5 μ specks of lanoline.
4171. HARBORNE, J. B.
Two new naturally occurring anthocyanidins.
Chem. Ind. Lond., 1960, No. 9, pp. 229-30, bibl. 9.
 The structure of rosinidin from *Primula rosea* and luteolinidin from *Gesnera cardinalis*. [See also *H.A.*, 28: 1785 h.]
4172. PLUMMER, T. P.
The influence of adenine and kinetin on bud initiation in *Saintpaulia*.
Afr. Violet Mag., 1958, 12(2): 26-8, from *Biol. Abstr.*, Sect. D., 1959, 33, Abstr. 42,787.
 Unrooted cuttings dipped in solutions of adenine sulphate or kinetin produced more buds (plantlets) than the controls. At concentrations giving the highest bud production kinetin retarded root formation, whereas adenine stimulated rooting slightly.
4173. MILLER, R. O.
What temperature for greenhouse snapdragons?
Ohio Fm Home Res. 1959, 44: 42-3, 47, illus.
 Exposing snapdragon seedlings in the greenhouse to temperatures of 60°F. or 70°F. for a short period, when they were small, caused the plants to flower earlier and produce larger blossoms than did the usual practice based on a minimum night temperature of 50°F. The earliest flowering was obtained by exposing the small seedlings to a temperature of 70°F. for 4 weeks after potting up and before planting in a greenhouse at 50°F. Prolonging high temperatures to the flowering stage proved detrimental. [For earlier work, see *H.A.*, 28: 2882.]
4174. TEAS, H. J.
Chemical modification of the ageotropic response in the snapdragon and gladiolus.
A.R. Fla agric. Exp. Stats, 1957-58, p. 79.
 N-1-naphthylphthalamate applied to control ageotropic curvature in cut snapdragons did not inhibit the normal opening of the buds [see also *H.A.*, 28: 2885]. It was noted that small bends present in the stem at the time of treatment did not straighten out as did the controls. In trials with gladiolus concentrations of N-1-naphthylphthalamate strong enough to control ageotropic bending of the spikes bleached the colour of flowers in one variety and inhibited the opening of buds in two others.
4175. CARLSSON, G.
 De dubbla plantorna hos lövkojan är mindre resistent mot groddbrandsvampar än de enkla. (**Double-flowered stock plants are less resistant to fungal root disease than single-flowered plants.**) [English summary 6 lines.]
Meddel. Gullåsk. VäxtförädlAnst., Hammenhög, 1959, No. 15, pp. 136-7.

4176. HESS, D.
Die Wirkung von Gibberellinsäure auf Entwicklung, Stickstoff- und Nucleinsäure-Gehalt von *Streptocarpus wendlandii*. (The effect of gibberellic acid on development and the nitrogen and nucleic acid contents of *Streptocarpus wendlandii*.)
Naturwissenschaften. 1959, 46: 408-9, bibl. 7, illus.

Analytical data are given for the basal quarters of the leaves of (1) vernalized short-day plants, (2) short-day plants treated with GA and (3) controls. In respect of flower induction and chemical composition GA did not prove to be a substitute for cold treatment.—Bot. Inst., Univ. Freiburg i. Br.

4177. JACOBS, S. E., AND DADD, A. H.
Antibacterial substances in seed coats and their role in the infection of sweet peas by *Corynebacterium fascians* (Tilford) Dowson.
Ann. appl. Biol., 1959, 47: 666-72, bibl. 4, illus.

Antibacterial substances active against *C. fascians* were shown to be present in the seed coats of varieties of broccoli, french bean, pea, sweet pea and tomato. There were considerable differences in activity between the seeds of different genera and species and between individual seeds of a single species. *C. fascians* also showed strain variation in sensitivity to the antibacterial substances of the seeds of any one species. An inverse relationship was demonstrated between the sensitivity of a strain to the sweet-pea seed substances and its ability to infect sweet-pea seedlings under laboratory conditions. [From authors' summary.]—Imp. Coll. Sci. Tech., London.

4178. PAILER, M., AND NOWOTNY, K.
Über das Vorkommen von β -Nitropropion-säure in den Wurzeln des wohlriechenden Veilchens (*Viola odorata*). (On the presence of nitropropionic acid in the roots of *Viola odorata*.)
Naturwissenschaften, 1958, 45: 419, bibl. 6.

4179. KENDER, W. J., AND CHILDERS, N. F.
Urea-formaldehyde as a source of nitrogen for zinnia.
Proc. Amer. Soc. hort. Sci., 1959, 74: 686-91, bibl. 10.

Urea-formaldehyde, a slowly available N carrier, and urea, a readily available carrier, were applied separately and combined in various ratios as soil applications to zinnias growing in outdoor containers in a sandy loam of low fertility. In the combined treatment plant growth and flowering increased as the percentage of urea in the mixture was increased. The use of urea alone resulted in nearly double the number of leaves, laterals and flowers, and hastened flowering, as compared with

the use of urea-formaldehyde alone. It is concluded that urea-formaldehyde is too slowly available for optimum growth of zinnias.—Rutgers St. Univ., New Brunswick, N.J.

Bulbs, tubers, etc.

(See also 3145, 4143, 4144, 4148, 4174, 4596, 4597, 4618, 4622, 4625, 4627.)

4180. OLIVER, R. W., FRESE, P. F., AND OTHERS.
Handbook on bulbs.
Plants and Gdns, 1959, 15(3), pp. 96, illus., price \$1.00 as a separate.

General articles in this handbook describe the various types of bulbs and their methods of reproduction. Charts are provided illustrating the correct time and depth for planting, the time of blooming, and common pests and diseases with their control. Special articles deal with the cultivation of standard and miniature bulbs for mass effects, for forcing, and in pots for indoor decoration. Details of the classification and the cultivation of tulips and daffodils are given, together with articles on the cultivation of lilies, colchicums, hyacinths, gladioli and small bulbs. The handbook, which is well illustrated throughout, concludes with an illustrated dictionary of bulbs, which outlines the culture of 52 types not previously mentioned.

4181. SCHOUTEN, A.
Het machinaal planten van bloembollen.
(Planting bulbs by machinery.)
Weekbl. BloembollCult., 1959, 70: 300.

Planting bulbs on ploughsoles 10–12 cm. deep after loosening the compacted soil, or 10 cm. deep in double ploughed furrows, is preferable to planting midway on the slope of 20 cm. furrows. On level, well-tilled land multiple-row planting machines are advantageous, but are liable to impair the structure and drainage of heavy soils. This difficulty is minimized in the caterpillar-tracked 5-row planter.

4182. D—, P.
Gunstig resultaat met nieuwe plantmachines.
(Favourable results with new planting machines.)

Weekbl. BloembollCult., 1959, 70: 316, illus.
Three bulb planting machines are described. The lightest, powered by a 2½ h.p. motor, costs f.5,000, and is highly recommended. A heavier 4½ h.p. machine has proved satisfactory; it costs f.5,700, and is probably the more suitable for heavy soil. The third, still in the experimental stage, is a caterpillar-tracked combination of planter and harvester, which will cost approximately f.11,000.

4183. KOPPE, S., AND ONDERWATER, L.
Toepassingen droogvloer in de praktijk.
(Practical applications of the drying floor.)
Weekbl. BloembollCult., 1959, 70: 280-1, 304, illus.

The construction, operation and economics of

drying floors are discussed in relation to the storage of narcissus bulbs in boxes or sacks, of iris bulbs with and without hot-water treatment, and of saleable tulip bulbs. The observations are based on the experience of growers, who found that considerable care was necessary with tulip bulbs to avoid cracking, and that previous packing in paper bags was an advantage. There was some indication that this method of storage checked the spread of *Fusarium oxysporum*.

4184. (SLOOTWEG, A. F. G.)
Aaltjesonderzoek in de bloembollen. (Research on nematodes in flower bulbs.)
Weekbl. BloembollCult., 1959, 70: 444.

Including observations on control by hot-water treatment of tulips, crocuses and irises.

4185. WEAVING, G. S.
Efficient hot water treatment plant.
Comm. Gr. 1960, No. 3349, pp. 619-25, illus.

A survey of growers' hot water bulb treatment plants in Cornwall and Lincolnshire has shown that square tanks are as efficient as round ones if a circulating pump is used; round tanks also benefit from such a pump. Steam heating is satisfactory, provided the pressure does not exceed 3-5 lb. per sq. in. after the bulbs are immersed. Electric heating, likewise satisfactory, has the added advantage that it can be automatically controlled. Direct heating using a single oil or gas jet is difficult to control. All tanks should be well lagged and fitted with insulated lids. Crates or trays are the best containers, although sacks with a $\frac{1}{4}$ - $\frac{1}{2}$ -in. mesh can be used; overloading should be avoided. Only mercury-in-glass thermometers calibrated for partial immersion should be used, but metal-encased ones are useless.—N.I.A.E.

4186. SLADKÝ, Z.
The application of extracted humus substances to overground parts of plants. [English, with Czech and Russian summaries 6 and 7 lines.]
Biol. Plant., Prague, 1959, 1: 199-204, bibl. 5, illus.

An alcoholic extract, humic acid and fulvic acid were successively extracted from garden compost soil and sprayed onto the leaves of *Begonia imperfoliens*. All the extracts, in particular the fulvic acid, increased the growth of roots and tops, oxygen consumption by the leaves and the chlorophyll content of the leaves. The root systems of sprayed plants had longer and more branched laterals than those of the control plants. [For earlier work see *H.A.* 29: 3132.]—Brno Univ.

4187. BOPP, M., AND NOACK, R.
Über die chemotropische Anlockung von Pollenschläuchen durch die Narben abgestuft zwittriger Begonienblüten. (The chemotropical attraction of pollen tubes by stigmas of hermaphrodite begonia flowers.)
Naturwissenschaften, 1959, 46: 236-7, bibl. 5.

Pollen of male flowers was more strongly attracted than that from hermaphrodite flowers, and the stigmata of female flowers had a greater attraction than those of hermaphrodite flowers.

4188. WILSON, J. Y.
Cytogenetics of triploid bluebells *Endymion nonscriptus* (L.) Garcke and *E. hispanicus* (Mill.) Chouard.
Reprinted from *Cytologia*, 1959, 23: 435-46, bibl. 29.

Polyploidy of these 2 species, at the triploid level, is recorded for the first time in *E. nonscriptus* and *E. hispanicus*, as well as in a putative hybrid form found in gardens. Cytogenetical studies of these 3 triploid forms showed that *E. nonscriptus* differed in many ways from the other two forms, which have very similar chromosome mechanics. There was evidence that the putative hybrid form was an autotriploid of a variety of *E. hispanicus*.

4189. WILSON, J. Y.
Chiasma frequency in relation to temperature.
Genetica, 1959, 29: 290-303, bibl. 48.

A review, with a note on experiments made on bluebells.

4190. WILSON, J. Y.
Temperature effect on chiasma frequency in the bluebell *Endymion nonscriptus*.
Reprinted from *Chromosoma*, 1959, 10: 337-54, bibl. 11.

4191. TAMM, R.
Flowering and propagation of crocuses in Estonia. [Estonian, with Russian and German summaries $\frac{1}{2}$ p. each.]
Toim. Tead. Akad. Eesti NSV, Ser. biol., 1959, No. 2, pp. 135-45, bibl. 4, illus.

At -3°C . the white and purple varieties of crocus suffer slightly from frost damage, whereas the yellow varieties are unaffected. Over a 3-year period the rate of multiplication of the yellow varieties reached 569%, that of the white varieties 565% and that of the purple varieties 229%. The best corms for propagation purposes were found to be those weighing 3g. or more, which in the white and purple types gave 1-2 flowers each and in the yellow types 1-6 flowers.

4192. LIMBURG, F.
Strijd tegen ziekten in de crocus: Doeltreffend middel tegen aaltjesiek. (The fight against diseases of crocus: effective measures against nematode sickness.)
Weekbl. BloembollCult., 1959, 70: 396.

The author discusses control measures adopted against tobacco rattle virus and ring spot virus. Symptoms on crocuses are briefly described. Hot water treatment is recommended for the control of *Aphelenchoides*. The larger corms are more sensitive to this treatment, some offshooting and loss of the main shoot being caused.

4193. KESSLER, G.

Zur Züchtung der Cyclamensorte Rosa von Zehlendorf. (**On the breeding of the cyclamen variety Rosa von Zehlendorf.**)

Gartenwelt, 1960, 60: 53-5, bibl. 2, illus.

It is suggested that the great variability of the cyclamen variety Rosa von Zehlendorf could be limited by the selection of pollen-sterile tetraploid plants to be used as female parents. The genetics and breeding of the variety are discussed.

4194. MAATSCH, R., AND ISENSEE, H.

Schnittblumenenerträge bei Cyclamen V. (**Cut flower yields from cyclamen, V.**)

Gartenwelt, 1960, 60: 46-7, illus.

The trials [see *H.A.*, 29: 1679 and earlier] were continued with a comparison between Lachs-Gefranstr and Rokoko from different sources.

4195. STALDER, L., AND OTHERS.

Versuche zur Bekämpfung der Wurzelbräune bei Cyclamen. (**Experiments on the control of root browning in cyclamen.**)

Schweiz. Gärtnerztg, 1960, 63: 17-20, illus.

As a result of experiments on the control of root browning in cyclamen, caused by *Thielaviopsis basicola*, it is recommended that the plants be watered with 0.5% Orthocide. The following times are suggested for the treatment: (1) When the roots are fully developed after the second pricking out; (2) when the roots are fully developed in the intermediate pot or in the frame; (3) immediately before transplanting into the final pot; (4) when the roots are fully developed in the final pot; with further treatments at 3-week intervals. The use of sterilized soil for potting helps to improve control—Eidg. Versuchsanst., Wädenswil, and Dr. R. Maag, A. G., Dielsdorf.

4196. MASON, E. C.

Observations on the life history and control of the vine weevil on cyclamen and foliage plants.

J. roy. hort. Soc., 1960, 85: 123-8, bibl. 5, and *Plant Path.*, 1960, 9: 29-33, bibl. 4.

Protection against the larvae of *Otiorrhynchus sulcatus* was afforded for 6-8 months by the addition of 3 oz. of 1½% aldrin dust or 4 oz. of 1½% dieldrin dust to each bushel of the compost in which the cyclamen were potted. Adults were controlled by parathion smokes, and, where non-bulbous plants were infested with larvae, a 0.01% γ BHC drench was effective. [From author's summary.]—N.A.A.S., Kirton, Lincs.

4197. ITO, A.

A study of breeding of freesia, *Freesia refracta* Klatt. [Japanese, with English summary ½ p.]

J. hort. Ass. Japan, 1959, 28: 193-9, bibl. 12, illus.

For seed germination the optimum temperature was

15°C., and none took place above 25°C. Germination was very irregular and extended over a long period. Seeds of the strain Super Giant had a higher germination rate and produced larger seedlings than those of the variety Alba. Flower bud differentiation was later in Super Giant than Alba irrespective of sowing time. Seedlings of Super Giant showed great variation in such characters as flowering date and stem length, but, as heritability is low, the greater part of the variation may have been due to environmental factors.

4198. MAGIE, R. O.

Gladiolus breeding.

A.R. Fla agric. Exp. Stats, 1957-1958, p. 317.

The yield and quality of flowers and plant vigour of a new variety (A199) named Florida Pink have been outstanding. It has considerable resistance to *Fusarium oxysporum* f. *gladioli*, *Curvularia trifolii* and *Stemphylium* sp. Resistance to *Botrytis gladiolorum* was as good as that of its pollen parent Spic and Span.

4199. GHITANY, M. Y.

Studies of the translocation and movement of essential elements absorbed or stored in the gladiolus plant tissues.

Alexandria J. agric. Res., 1959, 7(1): 134-68, from *Document. Bull. nat. Res. Cent. Cairo*, 1959, 5, Abstr. 5-100,931.

The elements N, K, Ca, P, Mg and Na increased in the contractile roots, the new corm and the cormels as these developed. Translocation of N occurred from the mother corm to the plant in the earliest stage. During flowering K, Ca, P and Mg increased in the inflorescence to a greater extent than occurred at any time in the foliage.

4200. KOSUGI, K.

Studies on blindness in gladiolus. V. Effects of daylength on the auxin level in the flower buds of gladiolus. [Japanese, with English summary ½ p.]

J. hort. Ass. Japan, 1959, 28: 188-92, bibl. 21, illus.

The variety Spotlight grown under long (24 hr.) and short (8 hr.) photoperiods from October 10 until November 6 was sampled for auxin content at weekly intervals, using the *Avena* coleoptile test. Auxin reaction from the short-day plants was less than from the long-day plants 2 weeks after the start of treatment, and the difference increased with time until finally the 8-hr. plants produced very little curvature. A lessening in the length of the flower spike in the short-day plants compared with the long-day plants was first seen 2 weeks after the start of treatment. This length difference increased with time, and blindness occurred in the 8-hr. plants 2 weeks later. No differences in the height of plants, number of leaves and length of stems

were noted between the long- and short-day plants. Anatomical studies showed that in 8-hr. plants cells at the top of the flower spike began to die 3 weeks after the start of treatment, and the death of cells proceeded downwards with time, resulting in complete death of the flower spike 1 week later. For part IV, see *H.A.*, 28: 2895.]

201. MAGIE, R. O.

Control of gladiolus corm diseases.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 309-11, illus.

When combined with husk removal, the best 5-minute pre-planting corm dip for both flower and corm production was Elcide 70 at 3 pt./100 gal. Dovicide B at 4 lb./100 gal. only increased corm production and parathion without a fungicide only increased flower production. When 3 organic mercury fungicides were tested for the control of *Fusarium*, a 15-min. dip in Elcide 70 at 3 pt./100 gal. resulted in the largest plants, with little or no phytotoxicity. For controlling root rot (*Stromatinia gladioli*) Mylone at 200 lb./acre well mixed with the soil was better than Mylone at 100 lb./acre. Capam at 36 gal./acre, injected to 5 in. with the soil surface sealed by sprinkling with water, was as effective as Mylone at 100 lb. with the soil sealed by pressing. A slightly acid 4-8-8 fertilizer applied at the time of treatment reduced the effectiveness of Mylone. [For earlier work, see *H.A.*, 29: 722 and 2755.]

202. LEBLOND, D., AND RICHARD, M.-A.

Essai de traitements de glaïeuls. (Trial treatments of gladioli.)

Rapp. Minist. Agric. Québec 1958-59, 1959, p. 55.

Dusting gladiolus corms with captan raised emergence from 45.8 to 74.4% and gave increases of 32.2% in the proportion of healthy plants and of 16.6% in flower production. Spraying the plants with the same fungicide at 2 lb. per 100 gal. of water (with a sticker) was less effective and not always beneficial to flowering. A combination of the 2 treatments was on the whole less satisfactory than corm treatment alone.

203. KLING, E. G.

On the physiology of gladioli infected with yellows disease. [Russian.]

Bjull. glav. bot. Sada, 1958, No. 30, pp. 72-7, bibl. 11.

Physiological aspects of infection by *Fusarium* spp. are discussed. The following control measures are recommended: Allow a 3-4-year interval before planting corms in fields that have had diseased plants, destroy all affected plants early in the season, apply NPK fertilizers at 1:3:2 or 1:3:3, disinfect corms after harvesting and before planting, and use resistant varieties.

4204. SCURTI, J. C.

La fusariosi dei gladioli. Caratteri dei ceppi di *Fusarium* isolati e prove orientative di lotta. (*Fusarium* infection of gladioli. Characteristics of the *Fusarium* strains isolated, and preliminary control experiments.) [English summary $\frac{1}{2}$ p.]

Not. Mal. Piante, 1959, No. 49/50, pp. 145-60, bibl. 32.

The experiments involved fungicidal treatment of the corms before and/or after storage, soil treatment, and spraying of the plants. The results led to the following recommendations: Healthy corms should be selected and dusted with organic mercury compounds, TMTD, naphthoquinone or benzoquinone products after autumn drying. Wet treatment should be given in spring before planting, using one of the above products not applied in autumn or an oxyquinoline product. The vegetative shoots should be sprayed with oxyquinoline products twice weekly during the first month and once a week during the second month or until flowering time. Further precautions include avoiding soil which has previously been infected, early planting and the choice of resistant varieties. —Lab. sper. Fitopat. and Osserv. Mal. Piante, Turin.

4205. VASIL'EVSKIY, A. P.

Sclerotium diseases of gladioli. [Russian.]

Cvetovodstvo, 1959, 2(5): 20.

Measures recommended for the control of *Stromatinia gladioli* and *Botrytis* sp. include treatment of the corms with 0.1% potassium permanganate or with 0.2% Granosan for 20 minutes, and spraying 2-3 times during the growing season with a copper solution at intervals of 13-15 days. Heavily infected fields should be sprayed twice with 0.5% Mercuran at a 13-day interval. These measures reduced incidence to 6% compared with 33% in the untreated fields.

4206. HOLMES, E. S., MYERS, J. M., AND MAGIE, R. O.

Gladiolus precooling and transit investigations.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 42-3 and 319-20, illus.

Cut gladioli lost moisture about 8 times faster at 89°F. than at 50°F. Buds of spikes cut early in the morning remained tighter in storage than those cut in mid-morning. Hydrocooling and fungicidal dip treatments were relatively safe in cool weather but appeared to reduce flower quality in warm weather. Varieties showed considerable variation in flower injury due to the treatments. [For earlier work, see *H.A.*, 29: 726.]

4207. U.S. DEPARTMENT OF AGRICULTURE

Growing iris in the home garden.

Home Gdn Bull. U.S. Dep. Agric. 66, 1959, pp. 8, illus.

Types, propagation and planting, pests and diseases.

4208. DUBROVSKIJ, V. P., AND NARDINA, N. S.
Iris maricoides Rgl. as an ornamental plant.
[Russian.]
Bot. Zhurnal, 1959, **44**: 985-7.

Recommendations for culture and details of period of growth and flowering.

4209. FORSBERG, J. L.
Iris diseases.
Ill. St. Flor. Ass. Bull., 1959, No. 199, pp. 10-12, illus., and No. 200, pp. 8-9, bibl. 16, illus.

Detailed, illustrated descriptions are given, together with methods of control, of the following diseases:—leaf spot caused by *Didymelina macrospora*, bacterial leaf spot caused by *Phytophthora tardicrescens*, rust caused by *Puccinia iridis*, mosaic, soft rot, crown rot, grey mould rot, ink spot, *Fusarium* basal rot, blue mould and *Rhizoctonia* neck and bulb rot.

4210. WOODRIF, L.
Succesvol winnen van lelies in Oregon.
(Successful breeding of lilies in Oregon.)
Canad. Flor., Sept. 1959, translated in *Weekbl. Bloembollcult.*, 1959, **70**: 302.

Crossing lilies of the *speciosum rubrum* type with *Lilium rubellum* advanced the flowering date to mid-May, even when the ancestry was only $\frac{1}{4}$ *rubellum*. In one hybrid the plant height was only 30 cm. and the flower colour was clear rose red. *L. auratum* hybrids with $\frac{1}{8}$ of their genotypic content derived from *L. rubrum* types also flowered in May, and their colour was better and more sun-proof than that of pure *auratum* types, being in some instances deep red. The hybrid *L. speciosum rubrum* $\times$ *L. henryi* (Black Beauty) is a giant form, but sterile.

4211. VASSILEVA-DRYANOVSKA, O. A., AND TSONEVA, M.
The dynamics of desoxyribonucleic acid in the fertilization and embryogenesis of lily. [English, with Russian summary 5 lines.]
C.R. Acad. bulg. Sci., 1959, **12**: 573-6, bibl. 14, illus.

In *Lilium regale*, *L. tigrinum*, *L. martagon* and *L. pomponicum*.

4212. CARLSSON, G.
Lagringsförsök med lökar av *Lilium regale*.
(Storage trials with bulbs of *Lilium regale*.)
[English summary 12 lines.]
Meddel. Gullåsk. VäxtförädlAnst., Hammenhög, 1959, No. 15, pp. 138-43, bibl. 4, illus.

Storage in damp peat at about 4°C. gave the best results, followed by storage at the same temperature in plastic bags. All bulbs stored at 18°C. died after they were planted out.

4213. BOODLEY, J.
Lilies for Easter.
Bull. N. Y. St. Flower Grs., 1959, No. 167, pp. 1-3.

Pre-cooled Croft lily bulbs potted in late December should be placed in a greenhouse with 60°F. night and 70-75°F. day temperatures. Plants that develop too early can be held for 2 weeks at 38-40°F. in the dark, after spraying with zineb ($\frac{1}{2}$ lb./100 gal.) to prevent botrytis.

4214. DUNHAM, C. W., AND CROSSAN, D. F.
Factors in tip-burn injury on leaves of Easter lilies.
Proc. Amer. Soc. hort. Sci., 1959, **74**: 704-10, bibl. 14.

Lilium longiflorum plants, varieties Croft and Giganteum, were grown in soil and sand cultures with differential fertilizer treatments. In the sand cultures, high Ca, high N, low P and low K concentrations all reduced tip-burn (or leaf scorch) injury, probably by affecting the absorption of Ca and its translocation in the plants. In the soil cultures the application of lime reduced tip-burn. Plants fertilized regularly with a mixture, in which 75% of the N was derived from calcium nitrate, had less tip-burn than plants fertilized with ammonium nitrate or urea. Circumstantial evidence indicates that the role of Ca in reducing tip-burn is related to its effect on internal moisture distribution.—Univ. Delaware, Newark.

4215. DUNHAM, C. W., AND FIELDHOUSE, D. J.
Growth, flowering and leaf scorch of Croft lilies as affected by moisture conditions in clay and plastic pots.
From abstr. in *Ill. St. Flor. Ass. Bull.*, 1959, No. 199, p. 14.

Leaf scorch in lilies grown in various combinations of 3 soil mixtures was increased both in very wet and in very dry soils. Plants flowered earlier in plastic pots and required fewer waterings and had higher soil temperatures than plants in clay pots, but root growth was more extensive in the latter.—Univ. Del., Newark.

4216. TAMMEN, J.
Easter lily root rot limits output of this holiday crop.
Flor. Exch., 1959, **133** (26): 8.

The effects of 4 levels of soil moisture on the incidence of *Rhizoctonia* brown rot, *Pythium* wet root rot and *Fusarium* rots were studied. The severity of the total root rot decreased with a decrease in soil moisture, but even at the lowest moisture level (permanent wilting point before rewetting to field capacity) more than 60% of the roots exhibited symptoms. In soil that was never flooded, however, wet root rot was non-existent, and brown rot was controlled by Terrachlor.—Pa. St. Univ.

4217. KAPINOS, G. E.

On a rare type of pollen in hybrid narcissi.
[Russian.]

Doklady Akad. Nauk. S.S.S.R., 1959, 129: 220-3, bibl. 16, illus.

Pollen grains of some hybrids of the Poetaz subgroup (*N. poeticus* × *N. tazetta*) were found to have more than the usual single longitudinal groove on the surface. The irregular grooves straightened during swelling of the pollen grains, exposing 3 or 4 germination pores instead of the usual one. Details of microsporogenesis are presented.

4218. DE MOL VAN OUD LOOSDRECHT, W. E.

Die Kohlensäure-Sauerstoff-Druckmethode zur Bekämpfung der grossen Narzissenfliege (*Lampetia equestris* F.). V. Das Blühen und das Wachstum der behandelten und dann im Frühling und Sommer 1942 im Freien gepflanzten Zwiebeln. (The control of the large narcissus fly by the carbon-dioxide-oxygen-pressure method. V. The flowering and the growth of the treated bulbs planted in the open in the spring and summer of 1942.) [English summary ½ p.]

Z. angew. Ent., 1960, 45: 382-94, bibl. 4, illus.

Flowering and growth of the narcissus plants was not affected by the treatment, some details of which are given in *H.A.*, 23: 2967.

4219. ANON.

Tulip forcing under plastic film.

Comm. Gr. 1960, No. 3354, p. 947, illus.

A technique, using black polythene film, has been evolved by a Bedfordshire firm, which makes it possible to force bulbs to flower within one month. The season extended from November until April. Rose Copeland and Krelage Triumph varieties were used, and the earliest batch of bulbs was set out in trays during September, and covered with soil and straw to 9-12 in. At the end of November, when the bulbs were 2 in. high the boxes were brought into a 60°F. greenhouse and the film laid directly on top of the bulbs. After 10-14 days, during which growth averaged 7-8 in., the film was removed and the plants grown in normal light for 2 weeks, by which time the flowers were ready for cutting. For Christmas flowering the boxes were brought indoors on 25 November and covered until 6-7 December.

4220. KOPPES, S., AND ONDERWATER, L. N.

Wat gebruiken we voor tulpendek? Wat is duurder, riet of stro? (What should we use for tulip mulching? Which is dearer, reeds or straw?)

Weekbl. BloembollCult., 1959, 70: 400.

Costs analysed and durability, advantages and disadvantages discussed.

4221. SHIBATA, M., AND ISHIKURA, N.

On anthocyanins in tulip flowers.

Naturwissenschaften, 1959, 46: 601-2, bibl. 4.

Six kinds specified with their R_f values.

4222. SINGER, F.

Wat zijn de oorzaken van het "zuur"? (What are the causes of "sourness" [of tulip bulbs]?)

Weekbl. BloembollCult., 1959, 70: 351.

Infection of tulip bulbs by *Fusarium oxysporum* is attributed to a weakening of resistance caused by various chemicals used for weed control and other protective treatments.

4223. MOORE, A.

Tulip eelworm.

Agriculture, Lond., 1960, 66: 452-8, bibl. 7, illus.

The symptoms are described and some alternative host plants are listed. Recommendations for prevention include the use of 1 gal. of cresylic acid per 100 gal. plus 1 gal. wetting agent as a disinfectant for washing tools and bulb trays. All bulb cleanings should be burned or deeply buried in grassland away from bulb fields. After-planting cultivation should always be in the same direction as the rows, and it is advisable to plant fields in the same order each year, preferably in that of lifting, to minimize eelworm spread. New stocks should be kept separate for at least 2 years so that their freedom from eelworm can be established. A purchaser should inspect prospective stocks at flowering. For infested bulbs a period of high temperature storage at 80°F. for at least 14 and probably 21 days followed by immersion in water containing a wetting agent at 110°F. for 2½ hr. appears to be the most successful cure. Varieties are listed according to the effect of hot-water treatment on subsequent survival and growth. In south Lincolnshire a form of hot-air treatment has been practised, in which the bulbs are kept in a glasshouse from lifting until planting, the temperature being allowed to rise with sun heat to well over 100°F. for longish periods. However, control by this method is not complete.—N.A.A.S., Lincs.

Lawns and sports turf.

(See also 4630.)

4224. NUTTER, G. C., BURT, E. O., AND CHRISTIE, J. R.

Factors affecting the growth of turf grasses. A. Nutrition. B. Plantbed sterilization for turf. C. Nematode investigations on turf grasses.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 131-5, illus.

As in the previous season [see *H.A.*, 29: 736] activated sludge produced the best Bermuda grass

turf. Fe chlorosis of centipede grass was seriously aggravated by sodium nitrate and ammonium nitrate, but corrected by ferrous ammonium sulphate. In general, 1.5 lb. N per 1,000 sq. ft. produced better turf than a 4.5-lb. rate, induced less chlorosis and rendered the grass more winter hardy. When 9 chemicals were tested as temporary soil sterilants, dalapon at 20 lb./acre gave good control of grasses for 3 months and the addition of 4 lb./acre of ATA suppressed broadleaved weeds. Simazine at 12 lb./acre was excellent against all weeds but showed a very long residual toxicity. Methyl bromide performed as well as usual and showed no toxicity 1 week after treatment. The 6 to 12-in. soil zone was found to contain from two to six times as many stubby-root nematodes (*Trichodorus* sp.) as the 0 to 6-in. zone, although the heaviest concentration of grass roots occurred at the upper level.

4225. ANTIPOV, V. G.

Gas resistance of lawn grasses. [Russian.]
Bot. Zhurnal, 1959, **44**: 990-2, bibl. 4.

Lawns exposed to the influence of industrial gases require more careful maintenance than ordinary city lawns. Reconditioning is needed every 2-3 years. Data on the survival of 17 lawn species under conditions of severe pollution are tabulated. *Agropyron repens* showed the highest resistance with 35% survival, followed by *Festuca rubra* and *Bromus inermis* with 21% and 18% survival, respectively.

4226. FREEMAN, T. E.

Diseases of turf grasses.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 142-3, illus.

Grey leafspot of St. Augustine grass was controlled by thiram, Kromad, chloranil or captan at 3-4 oz. per 1,000 sq. ft. applied at 8-10-day intervals.

4227. WAITE AGRICULTURAL RESEARCH INSTITUTE,
DEPARTMENT OF ENTOMOLOGY.

Insect and other lawn pests.

J. Agric. S. Aust., 1959, **63**: 159-63, illus.

Several pests are described. Permanent control of all lawn pests at all times may be obtained using lead arsenate at 1½ oz. per sq. yd. for 2 consecutive years and thereafter at 1 oz. per sq. yd. at intervals of 3 to 5 years.

4228. KERR, S. H., AND KUITERT, L. C.

Biology and control of insect and arachnid pests of turf grasses.

A.R. Fla agric. Exp. Stats, 1957-58, p. 99.

Tests were conducted on the control of chinch bugs on St. Augustine grass with 6 materials at 4 locations. As a result V-C 13 and diazinon have been added to the list of recommended insecticides

for chinch bug control. [See also *H.A.*, 2:9 2776.]

Foliage and succulent plants.

(See also 3132, 3149, 3157, 3165, 3175, 4196.)

4229. DICKEY, R. D., AND JOINER, J. N.

Identifying elemental deficiencies in foliage plants.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 130-1.

Sand culture techniques were used to establish 10 deficiency symptoms in *Philodendron oxycardium* and *Scindapsus aureus*. Deficiency symptoms for N, P, K, Mg, Ca and B have been determined and are here briefly described. In all cases except N symptoms developed earlier in *S. aureus* than in *P. oxycardium*.

4230. DICKEY, R. D.

Freezing injury to packaged foliage plants.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 719-29, bibl. 3.

Foliage plants grown in Florida frequently suffer cold injury during transport to northern markets during the winter. Experiments were conducted to determine the relative cold susceptibility of 4 species, and whether cold injury could be reduced by using suitable containers or insulating materials. The test plants (ex-pots and rooted cuttings) were stored at 0°F. *Philodendron* was injured more than pothos, and both were injured more than variegated peperomia or nephthytis (*Syngonium podophyllum*). Plants nearest the sides of containers were injured more than those in the centre. With single-walled corrugated fibreboard containers, lining with jiffy pads or 30 sheets of newspaper gave adequate protection for 1 hour, but no insulation was adequate for 2 or 4 hours' storage. For 4 hours' storage 30 sheets of newspaper gave better protection than jiffy pads. Double-walled fibreboard containers with jiffy pad liners were better than those insulated with 10 sheets of newspaper or than single-walled containers with jiffy pads. They protected philodendron plants in the coldest position in the box for about 2 hours. Plants completely covered by newspaper cylinders were less injured than plants with only the bottom half covered. The best protection (4 hours for philodendron) was given by an experimental container consisting of double-walled corrugated fibreboard with cut newspaper between the walls and lined with 30 sheets of newspaper.—*Fla agric. Exp. Stat.*, Gainesville.

4231. PORUBINOVSKAJA, E. D.

Concerning the cultivation of *Dioscorea* species in the Moscow region. [Russian.]

Bjull. glav. bot. Sada, 1959, No. 34, pp. 86-9, illus.

Dioscorea polystachya, *D. batata*, and *D. caucasica* successfully grown outdoors as ornamentals.

4232. KREZO, N. I., AND DOVGANIK, M. S.
The grafting of *Ficus* with softwood scions.
 [Russian.]

Cvetovodstvo, 1959, 2(4): 9, illus.

Strong shoots of 2–3-year-old *Ficus elastica* plants were grafted onto root cuttings 4–6 cm. long and were kept in the greenhouse at 20–22°C. They formed roots in 12–14 days, and 91% formed successful unions.

4233. SCHMALZ, H.

Der Einfluss alternierender Kurztag- und Dauertag-Perioden verschiedener Länge auf die generative Entwicklung der Sojabohne und *Kalanchoë blossfeldiana*. (The effect of alternating short-day and continuous light periods of various duration on the development of flowers in soya bean and *Kalanchoë blossfeldiana*.)

Naturwissenschaften, 1959, 46: 212, bibl. 3.

One or 2 10-hour days alternated with 1 or 2 24-hour days failed to induce *K. blossfeldiana* to flower, but 3 10-hour days alternated with 3 24-hour days caused flowering.

4234. MILLER, H. N.

Causes and control of diseases of potted plants.

A.R. Fla agric. Exp. Stats, 1957-1958, p. 137.

Dipping philodendron plants, before packing them in unventilated containers, in solutions of Agrimycin, Panodrench, Actidione S and Thylate greatly reduced losses from unspecified bacterial soft rots, but none gave complete protection.

4235. FUJIHARA, K.

Effects of gibberellin on the flowering of Christmas cactus. I. Effects of gibberellin given at various times prior to or after the start of short days. [English, with Japanese summary $\frac{1}{2}$ p.]

J. hort. Ass. Japan, 1959, 28: 200-8, bibl. 19, illus.

An aqueous solution of GA applied at the beginning of short-day treatment delayed flowering, whereas with applications made prior to short-day treatment the delay in flowering decreased as the number of days prior to treatment increased. An application made 7–10 days after the beginning of short-day treatment resulted in less delay in flowering. Applications made 14 or more days after the start of short-day treatment accelerated flowering. Concentrations of 5, 25 and 100 p.p.m. of GA had almost similar effects, and GA remained effective in the plants for at least 20 days. For the first 30 days after the start of short-day treatment the application of GA decreased the number of flowers, but subsequent applications increased the number. GA also resulted in the production of flowers with longer and more slender ovaries and corolla tubes. NAA applied 20 days or earlier after the start of short-day treatment delayed flowering by a few

days, irrespective of the time of application.—Kyoto Univ.

Orchids.

(See also 3102.)

4236. ELLE, A.

Ein neuer brauchbarer Orchideen-Pflanzstoff. (A new practicable planting medium for orchids.)

Gartenwelt, 1960, 60: 79.

Here is a grower's tested recipe: Take 40% of pine bark, 40% of sphagnum and 20% of dry leaves (beech or oak). The bark is cut into small pieces and graded in three different sizes with a riddle. The grain sizes should be 3–6 mm. for young plants, 1–2 cm. for medium plants and 3–5 cm. for adult plants set in pots not smaller than 12 cm. Fertilizers are applied at weekly intervals in the form of a 1% complete fertilizer solution when the plants are well rooted. The compost mixture has proved suitable for all genera of orchids, and its use has resulted in a considerable saving in labour.

4237. GÄUMANN, E., AND HOHL, H. R.

Weitere Untersuchungen über die chemischen Abwehrreaktionen der Orchideen. (Further studies on the chemical defence reactions of orchids.) [English summary 12 lines].

Phytopath. Z., 1960, 38: 93-104, bibl. 6.

About 36 hours after infection by *Rhizoctonia repens* the bulb tissues of *Orchis militaris* began to respond by producing the antibody orchinol [see H.A., 29: 3905]. This defensive activity reached a maximum after about 8 days. The defence reaction was not restricted to the tissues immediately threatened (tissue-immunity), but it extended to all parts of the bulb (organ-immunity). Round the focus of infection, however, there was an immunization-barrier about 6 mm. thick with a particularly high orchinol content, which sealed off the local focus. From this barrier to the distal tissues immunity decreased rapidly so that in these tissues the orchinol content was not always sufficient to protect them from new infections.—Inst. spez. Bot., Eidg. tech. Hochsch., Zürich.

4238. THOMPSON, A.

***Phytophthora palmivora*—a parasite of orchids in Singapore.**

Malay. agric. J., 1959, 42: 83-92, bibl. 8, illus.

Leaf rotting symptoms caused in periods of wet sunless weather are described. A suggested control measure during such periods is to move the plants to a sheltered position and blot off drops of water from the leaf axils. Spraying once a week with a copper fungicide is also effective. In plants with visible infections the prompt removal and burning of diseased leaves coupled with fungicide sprays are advised.—Univ. Malaya, Singapore.

Roses.

(See also 4258, 4589, 4613, 4625, 4627.)

4239. GORDON, W. C., BOX, C. O., AND GIRLING, C.
Best roses for Mississippi found by testing varieties.

Miss. Fm Res., 1959, 22(10): 1.

Hybrid teas and floribundas.

4240. JUDINCEVA, E. V.

The propagation of roses by soft-wood cuttings. [Russian.]

Bjull. glav. bot. Sada, 1958, No. 30, pp. 33-8, bibl. 5.

Soft-wood cuttings of heat-loving rose varieties should be taken at the end of bud formation. When rooted in a greenhouse cuttings from outdoor roses grew better than cuttings from greenhouse roses. Growing rooted cuttings during the first part of the winter in a cool greenhouse at 0-5°C., followed by heating and watering in the early spring, produced the strongest plants. Soil temperatures of down to -3°C. had a favourable effect on subsequent growth and flowering.

4241. DURKIN, D., LOVE, J., AND KIPLINGER, D. C.
Measurements of leaf temperature, apparent photosynthesis and production of Better Times roses under washed-air cooling and forced-air ventilation.

From abstr. in *Ill. St. Flor. Ass. Bull.*, 1959, No. 199, p. 14.

Leaf temperatures and apparent photosynthesis were measured on roses planted in March in a conventionally ventilated greenhouse and in one equipped with washed-air cooling. The temperatures of leaves under air cooling were 5° to 7°F. lower than in the normal greenhouse, their photosynthates were 20% higher and their stem lengths were increased, but their flower production decreased by 10%. Winter trials with forced-air ventilation showed negligible differences in photosynthetic products and leaf temperatures, but again stem length was increased and flower production reduced.—Ohio agric. Exp. Stat., Wooster.

4242. JACKSON, G. A. D., AND PROSSER, M. V.

The induction of parthenocarpic development in *Rosa* by auxins and gibberellic acid.

Naturwissenschaften, 1959, 46: 407-8, bibl. 3.

Several species of *Rosa* were successfully treated with three growth substances, the best results being obtained with a mixture of gibberellic acid and naphthaleneacetamide applied in lanolin to the flower buds of *R. spinosissima*. Parthenocarpic fruit set was very much better than that of pollinated flowers. [See also *H.A.*, 29: 3914].—Dep. Bot., Univ. Coll. N. Wales, Bangor.

4243. ROSEN, H. R.

Fungicides for control of black spot and other foliage diseases of roses.

Ark. Fm Res., 1959, 8(6): 12, illus.

During 1959 weekly foliar applications of Semicarbazone (dust), Phaltan (spray), Cyprex (dust), Acti-dione PM (spray), maneb (spray), COCS (spray) and an orchard oil spray and a soil application of captan (1 lb. 50% w.p./5 sq. ft.) were tested. Owing to the high rainfall and the presence of large quantities of inoculum none of the foliar sprays or dusts gave control, but control was obtained with the soil application of captan.

4244. BOURON, H., MIMAUD, J., AND RONZEL, G.
Essais de traitements contre l'oidium du rosier, *Sphaerotheca pannosa*. (Control experiments against rose mildew, *S. pannosa*.)
Phytiat.-Phytopharm., 1959, 8: 3-8.

Both sulphur and dinitrophenylcrotonate were equally effective, when treatment was started with the appearance of the first spots and repeated every 10 or 12 days. Sulphur caused some damage to the leaves but was more useful than the dinitrophenylcrotonate in that it also helped to control *Marssonina* infection.—Minist. Agric., Paris.

4245. SCHLINGER, E. I.

Diapause and secondary parasites nullify the effectiveness of rose-aphid parasites in Riverside, California, 1957-1958.

J. econ. Ent., 1960, 53: 151-4, bibl. 6.

Resulting in an unsatisfactory natural control of the rose aphid *Macrosiphum rosae*.

4246. ZAJANČKAUSKAS, P.

Piūkėliai (*Hymenoptera-Tenthredinoidea*)—rožių ir eršėkių kenkėjai. (Sawflies as pests of cultivated and wild roses). [Lithuanian, with Russian summary 1 p.]

Darb. Akad. Moks. LietTSR, Ser. B, 1958, 1(13): 107-22, bibl. 19.

Out of 19 sawflies observed on roses, the following proved the most damaging: *Arze rosae*, *A. pagana*, *Ardis bruniventris* and *Blennocampa pusilla*. They attacked *Rosa canina* and *R. arvensis* and, to a lesser extent, *R. chinensis*, *R. tomentosa* and *R. alba*. Dusting with 5% DDT killed all young larvae but gave only 49% control of the older larvae.

4247. LIAN, H.-C., AND FU, K.-Č.

The rose, a vitamin rich plant. [Chinese.]

Sên-usjuē Tunbao, 1957, No. 9, pp. 19-23, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,882.

The hips of *Rosa roxburghii* f. *normalis*, *R. acicularis*, *R. rugosa*, *R. davurica* and some other species contained, in addition to vitamin C, vitamins P, A₁, B₂, K and E.

Other trees and shrubs.

(See also 3254, 3532, 4599.)

4248. DE LA ROCHE, G.

Les plantations dans les parcs et les jardins. (Tree planting in parks and gardens.)

Bull. hort. Liège, 1960, 15: 50-2, 62, 138-40.

Choice and grouping of trees and shrubs according to soil conditions and plant ecology.

4249. REIMSCHUESSEL, E. F.

A checklist of ornamental evergreen shrubs and vines of Utah.

Proc. Utah Acad. Sci., 1958 and 1959, 1959, 36: 97-110.

A list of 185 varieties from 44 genera, with details of height, spread, hardiness and location. Soil alkalinity and low humidity are limiting factors.

4250. MELVILLE, R.

A metrical study of leaf-shape in hybrids: I. The leaf-shape of some F_1 hybrids and their parents.

Kew Bull., 1960, 14: 88-102, bibl. 7, illus.

The proposition that the leaf-shapes of hybrids are intermediate between those of their parents was examined metrically in 4 examples chosen from the genera *Forsythia*, *Prunus*, *Rhododendron* and *Ribes*. No exact intermediates were found in which the hybrid interaction was uncomplicated with some other phenomenon. The simplest type of interaction was an intergrading of characters along the leaf-axis, one parent being partially dominant towards the leaf-base and the other towards the apex, as in *Prunus* $\times$ *fontanesiana*. The parental effects were equally balanced in the *Rhododendron* hybrid, but there was positive heterosis on the character of relative leaf-breadth. In the *Ribes* hybrid axial intergrading was complicated by negative heterosis on the lengths of the large basal lobes of the leaf and positive heterosis on the breadths of the subterminal lobes. The *Forsythia* hybrid was found to have a leaf-shape exactly intermediate between the leaves of the simple leaved parent and the terminal leaflets of the other parent which had both simple and trifoliate leaves. The concepts of positive and negative heterosis are discussed. [Author's summary].

4251. DEMPSTER, C. D.

Propagation of shrubs under mist.

Sci. Hort., 1960, 14: 81-5, bibl. 8, illus.

Advice, based on experience with softwood cuttings of ornamental shrubs, on growth-substance treatment, after-rooting care, rooting media, time of propagation, bottom heat and equipment for mist propagation.

4252. DICKEY, R. D.

Effect of perlite, mixtures of perlite and peat and methods of watering on rooting of cuttings.

A.R. Fla agric. Exp. Stats, 1957-58, p. 128.

In continuation of earlier trials [see *H.A.*, 29:684] it was found that *Viburnum suspensum* and *Ligustrum japonicum* cuttings taken on January 8, May 23 and October 4 rooted equally well. Cuttings of *Rhododendron indicum* var. *Formosa* and *Camellia japonica* taken in the spring and autumn rooted much better than those taken in the winter.

Podocarpus macrophylla maki and *Ilex opaca* rooted fairly well in the winter and autumn and very well in the spring. *Thyallis glauca* rooted very poorly in the winter and autumn and fairly well in the spring. No season of taking cuttings, method of watering or propagation medium improved the strike of the shy-rooting *Feijoa sellowiana*. In general, intermittent mist gave better results than constant mist or than hand watering, and perlite-peat rooting media containing high peat contents (40-100%) gave better results than media with low peat contents (0-20%).

4253. IL'IN, S. G.

The effect of mineral nutrition on the seedling growth of ornamental trees. [Russian.]

Nauč. Dokl. vysš. Školy, Biol. Nauki, 1959, No. 4, pp. 140-6, bibl. 26, illus.

Differential NKP treatments were given to seedlings of *Juglans mandshurica*, *Ailanthus altissima*, *Acer ginnala*, *Phellodendron amurense* and *Malus niedzwetzkyana*. In all the plants, except *P. amurense*, the fertilizer mixture containing the highest proportion of P resulted in 3 times as vigorous growth as that containing the highest proportion of N. All treatments had an unfavourable effect on the growth of *P. amurense*.

4254. FORTNEY, W.

The effects of black plastic on growth rates of four species of nursery plants.

From abstr. in *Ill. St. Flor. Ass. Bull.*, 1959, No. 199, p. 14.

Height and spread of *Euonymus fortunei*, *Juniperus horizontalis*, *Ilex crenata* and *Cotoneaster microphylla* recorded at planting time and again 1 year later showed a marked increase when the plants had been mulched with black plastic film.—W. Va Univ., Morgantown.

4255. PIRONE, P. P.

The response of shade trees to natural gas.

Gdn J. N.Y. bot. Gdn, 1960, 10: 25-9, illus.

No toxic effects were noted when the roots of Norway maple, London plane and pin oak trees were exposed to natural gas for about 7 weeks. Likewise, the addition of the odorant mercaptan to the gas had no effect. Exposure to manufactured illuminating gas, however, permanently injured the trees within 10 days.

4256. PIRONE, P. P.

Why shade trees die along city streets.

Gdn J.N.Y. bot. Gdn, 1959, 9: 207-10, bibl. 4, illus.

Of 330 dead or dying shade trees in New York and northern New Jersey 275 were Norway maple (*Acer platanoides*), which appears to be particularly susceptible to fungus parasites and other ailments. The most common of these fungi was *Ganoderma lucidum*, which was found in 22.5% of the maples, followed by *Verticillium albo-atrum*, which infected

12.7% and by *Armillaria mellea*. At least 26 more fungi were also isolated. Other causes of premature death of Norway maples included girdling roots, damage by vehicles, malicious injury and chemical substances. The cause of death of 13.1% was unknown. Other trees observed included 24 maples of various other species, 12 planes, 8 elms, 5 oaks, 2 basewoods, 1 white birch and 1 sweet cherry, all of which were killed by fungi, mechanical or chemical injury.

4257. GARRISS, H. R.

Hemlock twig rust.

Ext. Folder N.C. agric. Ext. Serv. **172**, 1959, 1 folded sheet, illus.

For the control of *Melampsora farowii* on ornamental hedges and trees of *Tsuga canadensis* and *T. caroliniana*, spraying lime-sulphur at 8 lb. or ferbam at 4 lb. per 100 gal. plus a sticker is recommended. Spraying should be started at bud-burst and continued weekly until new shoot growth is over for the season.

4258. KUITERT, L. C., AND KERR, S. H.

Control of insect and arachnid pests of woody ornamentals.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 96-7.

Sprays containing Am. Cyanamid 12880 were effective against the tea scale on camellias, citrus white flies on gardenias and the scale *Phenacaspis natalensis* on magnolias, without injuring these plants or azaleas and roses. When potted camellias were dipped in sprays to control the tea scale, Trithion and parathion were equally effective, Dibrom was ineffective and Am. Cyanamid 12880 caused partial defoliation. Demeton, Aramite, Kelthane and Thimet gave good control of light to moderate infestations of two-spotted spider mites on roses, and Kelthane and Aramite were also effective when the mite population was high. Kelthane had a longer residual action than Aramite.

4259. WYMAN, D.

Many forms and uses rank maples high among shade trees.

Amer. Nurserym., 1959, **110**(7): 10-11, 88-94, illus.

The many species of *Acer* known in North America are listed under the headings, "Recommended", "Not recommended" and "Need more study". Brief notes on each species indicate height at maturity, hardiness, habit of growth, colour and shape of leaves and horticultural value.—Arnold Arbor.

4260. SCHOLZ, E.

Blütenmorphologische und biologische Untersuchungen bei *Acer pseudoplatanus* L. und *Acer platanoides* L. (Studies on flower morphology and biology in *Acer pseudoplatanus* and *A. platanoides*.)

Züchter, 1960, **30**: 11-16, bibl. 5, illus.

4261. PHILLIPS, I. D. J., AND WAREING, P. F.

Effect of photoperiodic conditions on the level of growth inhibitors in *Acer pseudoplatanus*.

Naturwissenschaften, 1958, **45**: 317, bibl. 2.

In *Acer pseudoplatanus* exposure to short-day conditions resulted in a greater production of growth inhibitor than occurred under long-day conditions. On the other hand, similar experiments with *Betula pubescens* and *Robinia pseudoacacia* have so far failed to reveal any significant differences in inhibitor level in response to different photoperiods.—Dep. Bot., Univ. Manchester.

4262. JAMES, L. M.

Production and marketing of plantation grown Christmas trees in Michigan.

Spec. Bull. Mich. agric. Exp. Stat. **423**, 1959, pp. 33, bibl. 3.

4263. VIACAVA, L.

La coltivazione del 'croton'. (The cultivation of crotons.)

Frutticoltura, 1960, **22**: 35-41, illus.

The temperature range for these plants is 13–35°C., but for the best results there should be little variation beyond 18–22°C. A marked fall in temperature, even for a few hours, causes defoliation. Constant high humidity is essential. Propagation by cuttings is described, and brief descriptive notes are given on 7 decorative varieties of the popular species [*Codiaeum variegatum*?]. Recommendations for protection from pests and diseases are outlined.

4264. LYALL, H. G.

My method with heathers.

Comm. Gr., 1960, No. 3343, p. 227.

A quick method of propagation involves taking cuttings of soft growing tips, an inch or more in length, snapped off over the thumb nail. They are inserted, untrimmed, in shaded frames in a rooting medium of 20% granulated peat and 80% washed sharp sand covered with $\frac{1}{2}$ inch of clean sand. Cuttings taken in June/July are ready to pot in late autumn; later cuttings are overwintered in closed frames and can be planted out into open beds at the end of May.

4265. REEKER, R.

Torfsubstrat, Grund- und Nachdüngung bei *Erica gracilis*. (Peat as a medium for *Erica gracilis* and basic and later fertilizer applications.)

Gartenwelt, 1960, **60**: 76-8, illus.

Following experiments the author concludes that high moor peat is more suitable for the cultivation of *Erica gracilis* than other kinds of peat. To the peat, when it is broken up, are added per cubic metre: 750 g. of a mineral "erica" fertilizer, 15 g. of iron chelate (Fetrilon) and 2 g. of sodium molybdate. Times and amounts of further fertilizer applications

are stated, and the use of a rapid test for nutrients is recommended.

4266. POLUNINA, N. N.

The flower biology and embryology of *Eugenia myrtifolia* Sims. [Russian.]

Bull. glav. bot. Sada, 1958, No. 30, pp. 59-65, bibl. 13, illus.

A detailed description of the flower biology of *Eugenia* spp. and a histo-chemical examination of seeds of *E. myrtifolia*.

4267. WYMAN, D.

The variable *Euonymus*.

Amer. Nurserym., 1960, 111(3): 18-19, 93-7, illus.

A critical evaluation of the various species and varieties.

4268. SHANMUGAVELU, K. G.

Anatomical responses of softwood cuttings of *Hibiscus rosasinensis* L. to indolebutyric acid.

Madras agric. J., 1959, 46: 484-5, bibl. 4, illus.

Following soaking in a 100 p.p.m. solution of IBA for 24 hours the collenchyma, endodermis, cambium and parenchymatous cells of *Hibiscus rosasinensis* cuttings were found to have become enlarged. The epidermis, xylem and pith did not appear to have been affected.—Annamalai Univ., Madras.

4269. WHEELDON, T.

Propagating holly under mist.

Amer. Nurserym., 1959, 110(7): 32-6, 41-6.

A Virginia grower describes in detail his methods of propagating holly under intermittent, time-clock controlled mist in saran cloth houses, glasshouses and a polythene film house. During 3 years he has obtained a rooting average of over 95%. The time clock is set daily according to the water content (determined by weight) of the rooting medium in test cutting boxes. A moisture content of 19-21% was found to be optimal. The rooting medium used was a mixture of 5 parts German peat, 3 parts filter sand and 2 parts perlite. The cuttings as well as the benches were sterilized with a mixture of captan and lindane.

4270. HERRIDGE, E. A., AND LAMBE, R. C.

A holly leaf spot associated with the use of copper fungicides.

Abstr. in *Phytopathology*, 1960, 50: 84.

Copper compounds, in particular tribasic copper sulphate, have been tested and used extensively in Oregon for control of green algae and *Phytophthora* leaf and twig blight on English holly. Because of reports of injury following the use of copper sprays, additional tests were conducted in 1958, in which tribasic copper sulphate, at rates of 2, 4 and 8 lb./100 gal. of water, and copper sulphate at 2 lb./100 gal. were applied to young trees. These applications were made in April and June. By mid-winter

raised circular, red spots were apparent on the under surface of sprayed leaves. Severity of spotting increased with increased rates of chemical. The spots apparently centred on stomata, and anatomical investigations showed deposition of resinous substances in the substomatal cells. The spongy mesophyll was greatly proliferated, and, through hypertrophy of the cells, the intercellular spaces were obliterated. Enlarged cells showed little or no chlorophyll. Although trials have been conducted on trees of different varieties and sizes for the past 5 years, this is the first instance in a controlled spray trial where injury has been associated with the use of copper.

4271. BREAKEY, E. P.

Holly insects and suggestions for their control.

Stat. Circ. Wash. St. agric. Exp. Stats 358, 1959, pp. 3.

The holly bud moth (*Rhopobota naevana ilicifoliana*) may be controlled by a summer oil spray containing nicotine sulphate applied in late March or by either Rhothane or diazinon applied after petal fall. DDT applied in May is effective against the holly leaf miner (*Phytomyza ilicis*). The recommended treatment for scale insects (*Coccus hesperidum*, *Aspidiotus brittanicus* and *Pulvinaria floccifera*) and for aphids is a malathion or diazinon spray.

4272. (OELKER, G.)

Le ortensie. (Hydrangeas.)

Frutticoltura, 1960, 22: 65-9, illus.

Growing *Hydrangea macrophylla* and *H. paniculata* in Italy.

4273. WYMAN, D.

Hydrangeas include old favorites in limited list of garden species.

Amer. Nurserym., 1959, 110(3): 14-15, 53-5, illus.

The relative merits are discussed of 24 species and varieties of hydrangea grown outdoors at the Arnold Arboretum.

4274. ASEN, S.

A rapid method for evaluating the color of *Hydrangea macrophylla* sepals.

Proc. Amer. Soc. hort. Sci., 1959, 74: 677-80, bibl. 6.

An objective method for evaluating the colour of hydrangea sepals in terms of a ratio of percentage reflectance measurement at two wave lengths was developed. This method revealed small differences between like-coloured hydrangea sepals that were difficult to resolve by visual means without recourse to involved and lengthy calculations. The ratio of the percentage reflectance at 630 and 430 m μ served as an index for evaluating the colour of hydrangea sepals. [Author's summary].—U.S. Dep. Agric., Beltsville, Md.

4275. BAJPAI, P. N., AND PARMAR, A. S.

A note on propagation of *Lagerstroemia indica* by cuttings with the aid of plant regulators.

J. Res. Sci. Agra Univ., 1958, 7: 167-9, illus., from *Biol. Abstr.*, Sect. D. 1959, 34, Abstr. 11,367.

Cuttings with leaves were superior to cuttings without leaves. With the former IAA at 0.04% gave 63% rooting and NAA gave 28%. There were no differences between these growth substances when used on hard-wood cuttings without leaves in two seasons.—Govt. agric. Coll., Kanpur.

4276. WYMAN, D.

Magnolias provide flowering trees for almost all sections.

Amer. Nurserym., 1960, 111(7): 12-13, 69, 72-80, illus.

Notes on the ornamental value and hardiness of the various species and varieties.

4277. WYMAN, D.

Philadelphus popular for spring white.

Amer. Nurserym., 1960, 111(5): 14-15, 68-73, illus.

A critical evaluation of the species, hybrids and varieties, with detailed notes of 28 that are highly recommended.

4278. MCFADDEN, L. A.

Nature, importance and control of diseases of minor fruits and ornamentals.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 352-3.

Manzate proved the most effective fungicide tested against *Sphaceloma poinsettiae* on poinsettia, followed by Parzate and tribasic copper sulphate.

4279. WELLS, J.

Best of the hardy azaleas.

Amer. Nurserym., 1959, 110(8): 17-18, 137-9, illus.

From careful observations on nearly 600 varieties of evergreen azalea over a number of years, the author has selected 16 on the basis of hardiness in the North-west United States and horticultural value. These represent 9 colour groups. Brief descriptions are given of each variety, with reasons for selecting it.

4280. MARCH, S. G.

Propagating Ghent and mollis azaleas.

Amer. Nurserym., 1959, 110(12): 98-101.

Various factors affecting the rooting under mist and subsequent establishment of cuttings of Ghent and mollis azaleas were studied over a period of 4 years at the U.S. National Arboretum, Washington, D.C. The most satisfactory equipment was found to be the Watco misting system, set for 6 seconds on and 3 minutes off from 6 a.m. to 8 p.m., the Florida 550A nozzles set 3 ft. apart on a bench 3 ft. wide, and electric heating cables to maintain a bench

temperature of 70-75°F. The best time for taking cuttings was while the new growth was still green but had just begun to harden. The ideal size for cuttings was 4-6 in. long. Good results were obtained from using Hormodin 3 as a dry dip and from inserting the cuttings in a rooting medium of 2 parts fibrous German peat and 1 part sharp sand. The cuttings were well rooted in 6 weeks. Overwintering proved difficult because the cuttings tended to become dormant after rooting and to die before the following spring. The use of artificial light from 8 p.m. to 6 a.m., given from the time of potting (usually the third week in July) until the first week in September, induced shoot growth immediately after rooting and enabled the plants to be overwintered satisfactorily in a cold frame or cold greenhouse.

4281. BOODLEY, J. W., AND MASTALERZ, J. W.

The use of gibberellic acid to force azaleas without a cold temperature treatment.

Proc. Amer. Soc. hort. Sci., 1959, 74: 681-5, bibl. 7, illus.

Forcing azaleas without a cold temperature treatment. Experiments with gibberellic acid.

Flor. Exch., 1959, 133(26): 9, 36.

Azalea plants of the varieties Hexe and Sweetheart Supreme, that had been grown to forcing size at a minimum temperature of 60°F., were treated with aqueous solutions of GA as a substitute for cold temperature treatment to induce uniform flowering. Weekly applications of GA at 1000-5000 p.p.m. resulted in uniform flowering within 5 weeks at a forcing temperature of 70°F., when treatment was started on 30 December. With earlier forcing or a lower temperature, a longer time was required to induce flowering.—Pa St. Univ., University Park.

4282. ENRIGHT, L. J.

***Cephalotaxus* cuttings respond to rooting aids.**

Amer. Nurserym., 1959, 110(7): 16, illus.

Tip cuttings of *Cephalotaxus harringtonia drupacea*, taken in June, were rooted under intermittent mist in coarse bank sand in the greenhouse. Three growth substance treatments were compared. The best rooting (100% very heavily rooted) was obtained with Rainbow Rooting Powder Woody (0.006% 2,4,5-T plus 0.012% NaNAA). The second best rooting (66% heavily rooted) was given by the untreated controls. Rainbow Rooting Powder Semi-woody (0.003% 2,4,5-T plus 0.006% NaNAA) gave 40% rooting, and Hormo-Root C (0.8% IBA plus 15% Thiram) gave only 6% very light rooting, possibly owing to toxicity.—Univ. Md, College Park.

4283. DAVIDSON, H., AND MCCALL, W.

Fertilizer studies on *Taxus*.

Quart. Bull. Mich. agric. Exp. Stat., 1959, 42: 317-22, bibl. 6.

In one experiment 2-year-old trees of *Taxus*

cuspidata were fertilized with 9 different mixtures applied at 3 lb. per 100 sq. ft. and in another with 6 rates of a 12-6-6 mixture. The lowest dressing of 12-6-6 fertilizer, namely 1 lb./1000 sq. ft., produced the best growth. There was no significant difference between the various mixtures applied at 3 lb./100 sq. ft., except for reduced growth with 33-0-0 and 0-0-60. Reduced growth also resulted from the application of 4 lb. or more of the 12-6-6 fertilizer, which lowered the pH of the soil and increased its soluble salt content. *Taxus* should be grown in soils with a salt content of less than 90×10^{-5} mhos.

4284. JAMES, B. L.

Absorption and translocation of maleic hydrazide in *Taxus media* 'Brown' as determined with a radioisotope.

Diss. Abstr., 1959, 20: 1944, being L. C. Card No. Mic. 59-5904, of 62 pp.

Absorption was studied at 3 relative humidity

levels, 97, 57 and 35%, and at two arbitrary soil moisture levels, "wet" and "dry". Less MH was absorbed as the R.H. was reduced from 97 to 35%, but the effect of a wetting agent was more noticeable at the two lower levels. Less MH was absorbed by *Taxus* growing in the dry soil, but at 97% R.H. the effect of soil moisture was less striking than at lower humidities. The amount of MH absorbed by *Taxus* was small compared with amounts reported for some herbaceous plants under similar conditions.—Ohio. St. Univ.

4285. GREEN, R. J., JR.

Seedling blight and root rot of *Taxus*.

Amer. Nurserym., 1959, 110(10): 62-3.

The disease, which causes browning and dying back of affected roots and shoots, was found to be due to a fungus tentatively identified as *Phytophthora cinnamomi*. Experiments showed that disease development is favoured by high soil moisture levels.—Purdue Univ., Lafayette, Ind.

SUB-TROPICAL FRUIT AND PLANTATION CROPS

General.

(See also 3236, 4619, 4620.)

4286. FLETCHER, W. A.

Survey of subtropical fruit orchards.

N. Z. J. Agric., 1959, 99: 570.

New Zealand production of *Actinidia chinensis*, *Feijoa sellowiana*, *Passiflora edulis* and *Cyphomandra betacea* in 1958.

4287. IKUBO, S., AND NISHIDA, T.

Studies on briny wind damage to fruit trees (I).

[Japanese, with English summary $\frac{3}{4}$ p.]

Bull. Tōkai-Kinki agric. Exp. Stat., hort Stat., 1959, No. 5, pp. 77-89, bibl. 7.

In general, salt was absorbed more rapidly at 70% R.H. than under drier conditions, when crystallization took place. Damage was avoided if fresh water was sprayed to remove salt from the leaves. Slight damage occurred when the salt content of the leaf tissue was 0.2 mg./cm². and severe damage with a salt content of 0.3 mg./cm². Satsuma orange was more resistant to salt-laden wind damage than deciduous fruits, such as peaches, pears and Japanese persimmons. A second blossoming caused by defoliation occurred frequently on pears, occasionally on peaches but not on persimmons. [See also H.A., 30: 1140.]

Avocadoes.

(See also 3110, 3667, 4597.)

4288. PHILIPPE, J., AND CORNELIS, P.

La reproduction végétative de l'avocatier. (Vegetative reproduction of avocado.)

Bull. Inf. I.N.É.A.C., 1959, 8: 273-81, bibl. 10, illus.

Of 4 methods of grafting the side cleft gave the best results (up to 94% success with the Gottfried variety on 1-month-old West Indian rootstocks).

4289. EMBLETON, T. W., JONES, W. W., AND GARBER, M. J.

Curvilinear relationship between leaf nitrogen and yield of Fuerte avocados.

Proc. Amer. Soc. hort. Sci., 1959, 74: 378-82, bibl. 9.

Yields and percentages of N in Fuerte avocado leaves were obtained on an individual tree basis from 95 trees for 5 production years from an experiment in which differential levels of N in the leaves were created by various fertilizer treatments. The curvilinear regression of yield on the percentage of N in the leaves on a "pooled within-year" basis, without regard to fertilizer treatment *per se*, was significant at the 1% level. The highest predicted production was associated with 1.79% N in leaves that expanded in the period April-June and were sampled in the period August-October. The highest N values in the leaves were associated with lower yields than were N values that were obviously inadequate for good vegetative growth and fruit production. The highest N values in the leaves were obtained with a maximum annual rate of 2 lb. N per tree. [From authors' summary and conclusions.]—Univ. Calif., Riverside.

4290. RUEHLE, G. D., AND YOUNG, T. W.

A study of diseases of the avocado and mango and development of control measures.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 357-8.

As substitutes for copper fungicides in the spray programme for the control of scab and cercospora spot on Lula avocadoes Actidione S was very

phytotoxic at 15 and 25 p.p.m. and prevented fruit set, Dyrene and Thioneb failed to control scab and Phaltan and Thylate, while promising against scab, did not control cercospora spot. Avocado seedlings of 4 varieties grown in soil inoculated with the burrowing nematode, *Radopholus similis*, showed retarded height growth.

4291. WOLFENBARGER, D. O., AND BARANOWSKI, R. M.

Biology and control of insects affecting subtropical fruits.

A.R. Fla agric. Exp. Stats, 1957-58, p. 361.

The avocado red mite, *Oligonychus yothersi*, was controlled by chlorobenzilate, wettable sulphur, Tedion and Kelthane sprays, and DDT also reduced mite populations. Diazinon 2% and Phosdrin 1½% dusts gave slightly better control of avocado white fly, *Trialeurodes floridensis*, than parathion 2% dust. [For earlier work, see *H.A.*, 29: 784.]

4292. DAVENPORT, J. B., AND ELLIS, S. C.

Chemical changes during growth and storage of the avocado fruit.

Aust. J. biol. Sci., 1959, 12: 445-54, bibl. 19.

A full account of work abstracted in *H.A.*, 30: 2700.

Carobs.

4293. SCHROEDER, C. A.

The floral situation of the carob in California.

Proc. Amer. Soc. hort. Sci., 1959, 74: 248-51, bibl. 2, illus.

From observations made on a variety collection over a period of 5 years it was concluded that the carob clones selected for trial in California could be classified into 5 groups, based on the development of the sexual structures. These groups are: (1) pistillate; (2) pistillate, with occasional perfect flowers or stamens; (3) perfect, with staminate flowers in some clusters; (4) perfect; (5) staminate. The provision of pollinators will probably prove to be essential for clones in groups 1, 2 and 3 to ensure adequate commercial fruit set.—Univ. Calif., Los Angeles.

Citrus—breeding, varieties and propagation.

(See also 3254, 4315, 4333, 4609, 4624, 4634.)

4294. PARLEVLIET, J. E., AND CAMERON, J. W.

Evidence on the inheritance of nucellar embryony in citrus.

Proc. Amer. Soc. hort. Sci., 1959, 74: 252-60, bibl. 12.

The degree of polyembryony of some 400 new citrus hybrids and their parent varieties was determined, and a possible genetic basis for the inheritance of polyembryony is discussed. Other experiments included in this study indicated that: (a) no important changes in mean embryo number occurred after seeds had reached nearly full development; (b) there was no association between fruit weight and mean embryo number in normally

healthy trees; (c) decrease in tree vigour was associated with lower mean embryo number in King tangor trees; and (d) the mean embryo number of seeds from the north sides of trees was significantly higher than that from the south sides.—Univ. Calif., Riverside.

4295. ZORIN, F. M.

Pollination and grafting in the breeding of citrus plants. [Russian, with English summary 6 lines.]

Vestn. s.-h. Nauki, 1959, 4(9): 133-7, illus.

Methods of vegetative hybridization, in which artificial pollination and grafting were combined, are described. Hybrids with the characteristics of the 3 or more parents, such as a dwarf hybrid of orange, kumquat and *Poncirus trifoliata* and a very small hybrid of mandarin, orange and lemon, which was only 75 cm. tall when full grown at 8 years, are considered to be especially striking achievements. The latter has not yet produced any fruit, but the author is confident that it will eventually produce good quality small fruit.

4296. KESTERSON, J. W., AND HENDRICKSON, R.

Florida citrus oils.

A.R. Fla agric. Exp. Stats, 1957-58, p. 208.

Lemon varieties listed which meet the minimum U.S.P. standards of aldehyde content and yield of essential oil.

4297. JACOBS, W. W.

Skin-budding offers new possibilities for citrus propagation.

Fmg S. Afr., 1960, 35 (11): 12-13, illus.

Because of their slow growth sweet orange and Empress mandarin rootstocks often require an additional year's growth before they can be T-budded. Preliminary experiments have shown that skin grafting of stocks only ½ in. thick at budding height is possible. A shield of bark 2-3 times as long as it is wide is removed exposing some wood and the cambial layers of the stock about 8 in. above soil level. A matching, thin oval shield with a bud in its centre and a very thin piece of wood attached is then cut from the budwood. PVC budding tape is used for binding. Leaving the bud exposed and wrapping it have both given equally good results, but in dry weather bud coverage may prove safer. The tape should be left in place for 2-3 weeks, and the stocks should be cut back to 1 leaf above the bud at this stage. Because of the slenderness of the stocks it is best to employ 2 people for this type of budding, especially for the wrapping.—Citrus Subtrop. hort. Res. Stat., Nelspruit.

4298. LYON, A. V.

Rootstock recommendations on stock-scion compatibility based on long-dated trials and observations.

Citrus News, 1959, 35: 67.

Rough lemon and Symon's sweet orange stocks are resistant to all the common virus diseases in Australia, but the former should not be used for mandarin. Sour orange stock may suffer complete collapse with the advent of tristeza virus but can still be used for lemons which do not show quick-decline symptoms. Trifoliata stocks are resistant to *Phytophthora* and wet soil conditions, but may carry scaly-butt disease.

4299. IVANOVSKAJA, G. O.

The effect of rootstock on the biochemical properties of the Chinese lemon. [Ukrainian, with Russian summary.]

Tr. Odessk. Un-ta. Ser. biol., 1957, **147** (8): 11-18, from *Ref. Ž. (Biol.)*, 1958, No. 19, Abstr. 87, 286.

In the leaves of Chinese lemon grafted on trifoliata orange amylase activity was lower, and the ascorbic acid content higher, than in the leaves of trees on lemon rootstock. Peroxidase activity in the leaves of plants on lemon began to decline in October, whereas it rose in those on trifoliata orange and thus increased frost resistance.

Citrus—climate, irrigation and nutrition.

(See also 3110, 4287, 4318, 4323, 4329, 4623, 4624.)

4300. COOPER, W. C., AND PEYNADO, A.

Winter temperatures of 3 citrus areas as related to dormancy and freeze injury of citrus trees.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 333-47, bibl. 23.

Southern California, central Florida and south Texas.

4301. KOO, R. C. J.

Evapotranspiration and soil moisture determination as guides to citrus irrigation.

A.R. Fla agric. Exp. Stats, 1957-58, p. 232.

One grapefruit and 3 orange varieties were irrigated in mid-November, about 4 weeks before frost occurred. One week after the frost Marsh grapefruit showed less than 5% leaf damage, Hamlin orange less than 25%, Pineapple between 25 and 50% and Valencia about 50%. No difference due to irrigation was found in the grapefruit and Hamlin orange. Non-irrigated Pineapple and Valencia trees, however, averaged 25 and 30% more damaged leaves than the irrigated trees. Two months after the frost fruit drop from non-irrigated and irrigated trees averaged 528 and 395 fruits per tree for Pineapple trees, respectively, and 206 and 155 for Valencia.

4302. HEFER, S. V.

Irrigation of citrus: amount of water required can be measured accurately.

Fmg S. Afr., 1960, **36**: 45-6.

Irrigation terminology and methods of measuring water requirements.

4303. FORD, H. W., AND PREVATT, R. W.

Tolerance of four citrus rootstocks to free water in certain sandy soils.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 232-3.

Results are given of greenhouse experiments, which show that under certain conditions sweet orange seedlings can live when the soil is flooded. Sour orange seedlings can live in water without aeration for at least one month. Steeped citrus roots produced an unidentified toxic substance, which caused citrus seedlings to wilt and die.

4304. (SOUTH AUSTRALIA DEPARTMENT OF AGRICULTURE.)

Nitrogen fertilizers for citrus.

J. Agric. S. Aust., 1959, **63**: 6.

The equivalent of 8 cwt. of ammonium sulphate per acre annually, half in August, half in February, plus 1 cwt. of superphosphate is recommended.

4305. CAHOON, G. A., AND OTHERS.

Effects of various types of nitrogen fertilizers on root density and distribution as related to water infiltration and fruit yields of Washington Navel oranges in a long-term fertilizer experiment.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 289-99, bibl. 16.

The treatments, which have been applied continuously since 1927, were no N, and urea, ammonium sulphate, calcium nitrate, sodium nitrate and manure, all applied at the rate of 3 lb. N per tree per year. In 1954 there was a change from clean cultivation to non-cultivation. In general, the urea and ammonium sulphate treatments produced the highest concentration of roots in the top 4 ft. of soil, and manure the lowest. Applications of ammonium sulphate, sodium nitrate and manure caused root density to be as great in the second foot of soil as in the first. In the case of the first 2 fertilizers this was attributable to effects on pH and salinity and was corrected by the application of calcium carbonate and calcium sulphate respectively. These amendments reduced the total concentration of roots but increased water infiltration and fruit yields. The manure treatment resulted in an excessively high percentage of K in the soil-exchange complex and the highest degree of water infiltration. A theoretical graph is presented correlating N source with root density, fruit yield and water infiltration. In general, the fertilizers which caused the higher rate of water infiltration produced the lowest root densities, and *vice versa*.—Univ. Calif., Riverside.

4306. AIYAPPA, K. M., AND SUBRAMANIAN, C. K.

Phosphates for citrus.

Mysore agric. J., 1959, **34**: 67-9,

Mandarin seedling growth responses in pot experiments.

4307. DESZYCK, E. J., KOO, R. C. J., AND TING, S. V.
Effect of potash on yield and quality of Hamlin and Valencia oranges.
Proc. Soil Crop Sci. Soc. Fla., 1958, **18**: 129-35, bibl. 11.

The effect of various levels of K was studied on 15- to 20-year-old trees during 1951-57. In both varieties K increased the yield and total dry weight of the crop; but the Hamlin trees grew taller and gave nearly twice the yield of the Valencias. Increasing the K dosage raised the acidity and vitamin C content of Hamlin fruit but lowered the soluble solids and the soluble solids/acid ratio in Valencias; the grade of Valencia fruit was also reduced more than that of Hamlin. The reducing, non-reducing and total sugar contents were high in Valencias, but the reducing and total sugars were lowered in both varieties by increasing amounts of K.—Citrus Exp. Stat., Lake Alfred, Fla.

4308. SMITH, P. F., AND RASMUSSEN, G. K.
Relation of potassium nutrition to size and quality of Valencia oranges.
Proc. Amer. Soc. hort. Sci., 1959, **74**: 261-5, bibl. 4, illus.

Young Valencia orange trees were grown to fruiting in large outdoor sand cultures, the only variable being the ratios of the 3 base elements K, Ca and Mg applied as carriers of a constant supply of nitrate N. In this way it was possible to establish a wide range in leaf K with constant Ca and conversely a wide range in leaf Ca with constant K. The varying elements were induced to reciprocate with Mg. The results indicate that the K level in the plant strongly influenced fruit size and degree of coarseness, whereas changes in Ca or Mg levels had little, if any, effect. Likewise the changes in juice quality were affected primarily by the K status of the tree. [From authors' summary. See also *H.A.*, 30: 2727.]—U.S. Dep. Agric., Orlando, Fla.

4309. MARTIN, J. P., BITTERS, W. P., AND ERVIN, J. O.
Influence of exchangeable Na and K and of excess lime on growth and chemical composition of trifoliolate orange seedlings.
Proc. Amer. Soc. hort. Sci., 1959, **74**: 308-12, bibl. 10.

A study was made of the effect of exchangeable cation percentages in a clay loam and a sandy loam soil on the growth of trifoliolate orange seedlings and on the composition of their leaves and roots. Increasing concentrations of Na and/or K decreased growth, the effect being much more severe in the clay loam soil. The growth effects of Na and K were additive. Increasing the soil Na decreased leaf Ca and increased leaf K percentages. Lettuce and radish plants, grown for comparison in the clay loam soil, grew well at all exchangeable Na and K levels tested.—Univ. Calif., Riverside.

4310. EMBLETON, T. W., AND JONES, W. W.
Correction of magnesium deficiency of orange trees in California.
Proc. Amer. Soc. hort. Sci., 1959, **74**: 280-8, bibl. 36.

See *H.A.*, 29: 2840 and 30: 1151.

4311. LABANAUSKAS, C. K., JONES, W. W., AND EMBLETON, T. W.
Seasonal changes in concentrations of micro-nutrients (zinc, copper, boron, manganese, and iron) in leaves of Washington Navel orange.
Proc. Amer. Soc. hort. Sci., 1959, **74**: 300-7, bibl. 16.
Seasonal changes of micronutrient concentrations in Washington Navel Orange leaves.
Calif. Agric., 1960, **14**(2): 14.

Concentrations of Zn and Cu in the leaves tended to decrease, and those of Mn, B and Fe tended to increase, with the age of the leaf throughout the seasons until midwinter, and then, before and during the initiation of new bloom and growth flush, they levelled off with relatively small decreases and and increases, respectively. B concentration remained constant during the winter months. Zn, Cu, Mn and B concentrations decreased slightly during bloom and the initiation of the new flush at the end of the growing season. The Fe concentration increased with the age of the leaf throughout the growing season, with no apparent indication of outward movement of Fe at any time during the season. Linear trends downward for Zn and Cu and upward for Mn, B and Fe concentrations were highly significant throughout the growing season. Significance of quadratic trends indicates that the linear trends upward and downward, respectively, are levelling off in the latter part of the growing season with relatively small decreases for Zn and Cu and small increases for Mn, B and Fe concentrations in the leaves. [From authors' summary of first paper].—Univ. Calif., Riverside.

4312. BAR-AKIVA, A., AND HEWITT, E. J.
The effects of triiodobenzoic acid and urea on the response of chlorotic lemon (*Citrus limonia*) trees to foliar application of iron compounds.

Plant Physiol., 1959, **34**: 641-2, bibl. 6, illus.
 TIBA sprayed on foliage or roots had no effect on the penetration or mobility of foliar Fe applied as radioactive FeCl_3 . The application of 2% urea together with ferric chloride or ferrous sulphate resulted in more uniform chlorophyll production. Urea did not, however, promote any movement of Fe across the leaf or from one leaf to another. The combined use of urea and TIBA showed no advantage over urea alone.

4313. CARPENA, O., GUILLÉN, M. G., AND COSTA, F.
Deficiencia de manganeso en citrus. 1. Limonero. (**Manganese deficiency in citrus. 1. Lemon trees.**) [English summary $\frac{1}{2}$ p.] *An. Edafol. Fisiol. veg.*, 1959, **18**: 765-82, bibl. 72, illus.

Lemon trees of the variety Verna in moderately calcareous districts of Murcia showed symptoms of Mn deficiency, in some instances producing no fruit. Where soil lime was more abundant, the deficiency was of Fe, but the 2 sets of symptoms were mutually exclusive. In addition to noting visual symptoms, Mn deficiency was diagnosed by various methods, of which immersion was the most practical and gave the most spectacular results. Foliar Mn averaged 21.1 p.p.m. in normal, and only 6.7 p.p.m. in deficient samples. The soil contained sufficient active Ca to maintain low values of exchangeable and easily reducible Mn, and was poor in organic matter. Normal leaves contained significantly less N and Fe than Mn-deficient leaves. The symptoms were completely cured by spraying late in the afternoon with 0.3% manganese sulphate + 0.15% sodium carbonate, and the addition of 0.1% Neutronyx 600 as a spreader was an advantage. Serious damage was done when the sodium carbonate was omitted. The trees received 10-20 l. each according to their size. [For Fe deficiency in this lemon variety, see *H.A.*, 27: 3844.]

4314. AIYAPPA, K. M., DIKSHIT, N. N., AND BOJAPPA, K. M.

Response of old mandarin trees (*Citrus reticulata* Swingle) to fertilization and micro-nutrient sprays in Coorg.

Mysore agric. J., 1959, **34**: 70-6, bibl. 10.

Chlorotic trees were fertilized with N, P and K fertilizers, and sprays containing Zn, Mg, Mn, Cu, Fe, Mo and B, either singly or in combination, were applied twice a year for 4 years. Of the sprays used, only zinc, alone or in mixtures, gave good results in reducing chlorosis.

Citrus—growth and physiology.

(See also 3124, 3167.)

4315. FORD, H. W.

Growth and root distribution of orange trees on two different rootstocks as influenced by depth to subsoil clay.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 313-21, bibl. 12.

A study of tree height and feeder root distribution was conducted in 7 commercial groves of Hamlin and Valencia oranges on Cleopatra mandarin and rough lemon rootstock varying in age from 15 to 21 years. Red sandy clay underlay 5 of the groves and was 18 in. to 15 ft. below the soil surface. Hamlins and Valencias on Cleopatra stock were

1.5 to 3 ft. taller when the root system penetrated the red lateritic sandy clay. Orange varieties on rough lemon decreased in height when the clay was close to the surface. The fact that a significant increase in tree growth occurred when Cleopatra roots entered clay suggests that this factor should be considered in planting new grove sites. Restriction in root growth imposed by the clay did not consistently increase feeder root concentration in the sand above the clay. There was also no relationship between depth of the sand phase and the number of roots that penetrated the clay. Root growth ceased when the clay content was above 28%. Feeder root concentrations of 15-year-old Hamlins and Valencias on Cleopatra stock growing in deep sand were greater, even though the trees were smaller, than the same scions on rough lemon stock. [Author's summary.]—*Citrus Exp. Stat.*, Lake Alfred, Fla.

4316. CAHOON, G. A., AND STOLZY, L. H.
Estimating root density and distribution in citrus orchards by the neutron moderation method.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 322-7, bibl. 11.

By measuring the amount or rate of moisture depleted from the soil, using a portable neutron rate meter [see *H.A.*, 28: 1841i].

4317. IWASAKI, T., ŌWADA, A., AND IYU, Y.
Studies on the differentiation and development of the flower bud in citrus. I-VI. [Japanese, with English summary $1\frac{1}{2}$ pp.] *Bull. Tōkai-Kinki agric. Exp. Stat., hort. Stat.*, 1959, No. 5, pp. 1-76, bibl. 135, illus.

In the Satsuma orange flower bud differentiation generally begins in the middle of August and continues until the end of March. Growth promoting factors such as sufficient nutrients and high temperature inhibit initiation of the flower buds but promote their further development. Drought or transplanting may cause differentiation of flower buds in the summer and a second blooming with the stimulation of summer shoot growth caused by the defoliation and by rainfall following the drought. Lemon trees, which flower continuously, differentiate flower buds a little earlier than Satsuma orange. In the orange the tree's nutrition during the period May to March, and especially before mid-November, affects the next year's flowering.

4318. HALE, V. Q., AND WALLACE, A.
The effects of different chelating agents on CO₂-fixation reactions in preparations from rough lemon and bush bean.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 358-66, bibl. 13.

It was found that some chelating agents inhibited both of the reactions tested, while others stimulated

the reactions, and still others behaved differently with the different reactions. An enzyme kinetics study of the inhibition of HEEDTA revealed that both reactions were inhibited non-competitively by the chelating agent. There was a pronounced relationship between chelating agents producing toxicity in plants and those inhibiting CO_2 fixation. Those most effective in increasing plant growth did not necessarily stimulate CO_2 fixation in all cases. [From author's summary.]—Univ. Calif., Los Angeles.

4319. HUFFAKER, R. C., AND WALLACE, A.
Dark fixation of CO_2 in homogenates from citrus leaves, fruits, and roots.
Proc. Amer. Soc. hort. Sci., 1959, 74: 348-57, bibl. 28.

Homogenates from citrus leaves, roots, fruit peel and fruit vesicles all carried out dark fixation of CO_2 with appropriate substrates. Pentose cycle substrates resulted in substantial CO_2 fixation in leaves and in peel. Phosphoenolpyruvic carboxylase and carboxykinase activities were demonstrated in leaves, roots, fruit flavedo and in fruit vesicles. Activity in vesicles continued throughout fruit maturity. These reactions are possibly related to the synthesis of organic acids in citrus fruits. Homogenates from all parts of the trifoliate orange tested showed greater CO_2 fixing activity for each of the three systems studied than homogenates from rough lemon. AsO_4^- , HPO_4^- , and heavy metals decreased CO_2 fixation in systems prepared from citrus fruit vesicles. [Authors' summary.]—Univ. Calif., Los Angeles.

Citrus—pollination, fruit development and composition.

(See also 3498, 4308, 4634.)

4320. MINESY, F. A.
Effect of different pollinizers on yield [and] seediness in Clementine tangerine.
Alexandria J. agric. Res., 1959, 7(1): 279, from *Document. Bull. nat. Res. Cent. Cairo*, 1959, 5, Abstr. 5-100,932.

Cross pollination was more necessary in years of light than in years of heavy fruit set. Fruit size and seed number were variously affected by different pollen sources. Fruit growth was stimulated by seed formation.

4321. ROBINSON, F. A., AND KREZDORN, A. H.
Factors affecting the unfruitfulness of tangelos.
A.R. Fla agric. Exp. Stats, 1957-58, pp. 102 and 230.

An unsuccessful attempt was made to increase fruit in Orlando tangelo by using beehive pollen inserts. In cross-pollination trials the pollen of Temple orange induced the highest percentage of

fruit set [see also *H.A.*, 29: 1832]. Of 3 fruit-set-promoting substances tested Gibrel was the most promising. Girdling produced an appreciable but inconsistent increase in set over the ungirdled controls, which were practically fruitless.

4322. MIWA, T., GOMI, K., AND YAMAMOTO, S.
Studies on fruit (blossom) thinning of citrus by chemicals. 1. Thinning effect of chloric compounds and hormones. [Japanese, with English summary].
Bull. Fac. Agric. Univ. Miyazaki, 1958, 3(1/2): 90-9, from *Biol. Abstr.*, Sect. D, 1959, 33, Abstr. 42,766.

To explore the possibilities of thinning by spraying at different stages (flower bud, full bloom, old flower, and young fruit) the authors tried sea water, NaCl, MgCl, potassium chlorate, maleic hydrazide and 2,4-D. The greater the amount of spray and the higher the concentration of the chloric compounds, the greater was the thinning effect. The effect was greater in the old flower and young fruit stages than at other times. A 3% solution of potassium chlorate or of sodium chloride produced a thinning effect, but spray injury was also severe. A solution of MgCl added to sea water reduced both the thinning effect and spray injury to leaves. A thinning effect observed 2-5 days after treatment was still evident 10 days later. Maleic hydrazide had some effect, but both the development and quality of fruit were inferior. 2,4-D was fairly effective, but spray injury to leaves was severe.

4323. HILGEMAN, R. H., TUCKER, H., AND HALES, T. A.
The effect of temperature, precipitation, blossom date and yield upon the enlargement of Valencia oranges.
Proc. Amer. Soc. hort. Sci., 1959, 74: 266-79, bibl. 14.

From growth measurements made at 3- to 14-day intervals from 1949 to 1957 4 main stages of fruit growth were distinguished: (1) Bloom to 14 June, the fruit setting stage; (2) 15 June to 20 November, a stage of rapid uniform growth during which 70% of the growth occurred; (3) 21 November to 28 February, with variable growth related to the extent of freezing conditions; (4) 1 March to 15 May, the fruit maturing period with slowly decreasing growth. During stage 2 temperatures above 100°F. depressed the growth rate and precipitation increased it. The total growth made during stage 2 was negatively correlated with the number of fruits per tree, with the temperature sums above 100°F. and with earliness of flowering. During stage 3 no fruit growth occurred at temperatures of 30-33°F., and shrinkage of fruit occurred when the temperature dropped to 28°F. and below.—*Ariz. agric. Exp. Stat.*, Tucson.

4324. LEVICKAJA, A. M.

Abnormal fruits of lemon (*Citrus limon* Burm). [Russian.]*Bot. Žurnal.* 1959, **44**: 1283-6, bibl. 3, illus.

Illustrated description of 4 stages of development of asymmetrical beaked fruits observed on a budded tree.

4325. DESZYCK, E. J., AND TING, S. V.

Statistical analysis of data concerning juice characteristics of pink and red grapefruit and navel oranges.*A.R. Fla agric. Exp. Stats*, 1957-58, p. 231.

Soluble solids, titratable acidity, juice content, naringin, carotene, lycopene and flesh colour in samples collected from 1953 to 1957 in 140 groves.

4326. PURCELL, A. E., AND STEPHENS, T. S.

Determining the effect of reciprocal grafts of red and white varieties of grapefruit on the accumulation of carotenoids.*Proc. Amer. Soc. hort. Sci.*, 1959, **74**: 328-32, bibl. 6.

Seven scions of the Ruby Red variety of grapefruit, each bearing a single fruit, were grafted onto branches of white grapefruit trees, and six scions of the Marsh white variety of grapefruit, each bearing a single fruit, were grafted onto branches of red grapefruit trees. After $3\frac{1}{2}$ months three of the fruits of each variety, and again after $4\frac{1}{2}$ months the remaining fruits of both red and white varieties, were harvested from the grafted trees and assayed for carotene and lycopene content. Red and white fruits of the donor trees were assayed at about the same time. It was found that the characteristics of the fruit were not significantly changed by the variety of tree onto which the fruits were propagated. The results of this experiment indicate that the chemical difference leading to the accumulation of larger amounts of pigment in coloured varieties is within the fruits. [Authors' summary.]—U.S. Fruit Veg. Prod. Lab., Weslaco, Texas.

4327. DUNLAP, W. J., AND WENDER, S. H.

Purification and identification of flavanone glycosides in the peel of the sweet orange.*Arch. Biochem. Biophys.*, 1960, **87**: 228-31, bibl. 11.

Hesperidin was the major flavanone glycoside present; naringin and isosakuranetin 7-rhamnoglycoside were present in small quantities, and the presence of others was indicated.—Univ. Okla, Norman.

4328. TING, S. V.

Chemical constituents of citrus fruit as related to quality.*A.R. Fla agric. Exp. Stats*, 1957-58, p. 251.

On fresh weight basis grapefruit juice contained 0.05% and orange juice 0.10% of protein.

Citrus—diseases and pests.

(See also 4298, 4354, 4355, 4597, 4616, 4623, 4634.)

4329. WEATHERS, L. G.

The effect of host nutrition on the development of exocortis in *Poncirus trifoliata*.Abstr. in *Phytopathology*, 1960, **50**: 87.

The effect of N and P on host growth and development of exocortis in *Poncirus trifoliata* rootstocks with Eureka lemon (*Citrus limon*) tops was studied by growing the host in quartz sand and supplying nutrient solutions varying in N and P. In the case of N, plants showed an optimum growth at 210 p.p.m. Above that level marked stunting occurred. Development of exocortis symptoms was directly correlated with the increase of N. At 1050 p.p.m. bark symptoms characteristic of exocortis appeared in *P. trifoliata* rootstocks within 10 months of inoculation. At 630 p.p.m. symptoms developed within 14 months. Symptoms did not appear in plants at the 210 and 50 p.p.m. levels after more than 21 months. With P, optimum growth occurred at 37 p.p.m. Some stunting occurred at higher levels, but was much less marked than with N. Plants at the highest level of P (547 p.p.m.) developed exocortis symptoms within 14 months of inoculation. Exocortis symptoms did not appear in plants at levels of P below 547 p.p.m. after more than 21 months. Bark samples were removed from the rootstocks 15 months after inoculation, sectioned, and treated with phloroglucinol-HCl. Plants showing bark symptoms of exocortis all gave positive colour reactions; those without symptoms all reacted negatively.

4330. COHEN, M.

Control of greasy spot in the Indian River area.*A.R. Fla agric. Exp. Stats*, 1957-58, pp. 253-4.

When grapefruit trees were rated on the basis of foliage density, it was found that tribasic copper sulphate sprays at 0.53 lb. metallic copper per 100 gal., applied alone and in combination with zineb at 0.98 lb. in the summer, were the most effective treatments. For preventing the development of greasy spot symptoms 1.3% oil was as effective as copper or copper-zineb.

4331. SUIT, R. F., AND COHEN, M.

Investigations of melanose and stem-end rot of citrus fruit.*A.R. Fla agric. Exp. Stats*, 1957-58, pp. 197-8.

Tribasic copper sulphate (0.75 lb./100 gal.) and a mixture of zineb and tribasic copper sulphate (0.65 + 0.75 lb./100 gal.) applied one week after flowering gave good control of melanose on both oranges and grapefruit. When a second treatment was applied 5 weeks later to the oranges, even better results were obtained. Tribasic copper sulphate (0.8 lb./100 gal.) was also the best material for protecting Temple oranges against citrus scab,

giving 81.6% clean fruit, being followed by ferbam (1.52 lb./100 gal.) with 71.6% and thiram (1.3 lb./100 gal.) with 45.2% clean fruit. In general, copper-containing materials, Agrimycin and Tennam gave the best results against brown rot.

4332. DIMITMAN, J. E., AND KLOTZ, L. J.
Effect of the stem girdling of citrus seedlings on size of phytophthora gummosis lesions.

From abstr. in *Phytopathology*, 1960, 50: 83.

Seedlings of lemon and sweet and sour orange were girdled and subsequently inoculated, above and below the girdle, with isolates from *Phytophthora citrophthora* and from *P. parasitica*. In the sweet orange girdling reduced the size attained by the lesions after 60 days, especially those below the girdle. This was also the case with lemon, but less so. In sour orange only slight differences were noted.

4333. EGOROVA, G. N.
Distinguishing characteristics of citrus species resistant to mal secco. [Russian.]
Biohim. Plod. i Ovošč., 1958, No. 4, pp. 112-17, bibl. 2.

Citrus varieties resistant to mal secco (*Deuterophoma tracheiphila*) differ from susceptible varieties in having a higher peroxidase activity, e.g. peroxidase activity in leaves of the resistant Chinese lemon is 1.8 times greater than that in leaves of the susceptible Novogruzinski lemon. The alkaloid content in the leaves and branches of resistant varieties is up to 3 times greater than in those of susceptible varieties. Sivamikan and Chinese lemon are recommended as the varieties most resistant to the disease; they also show considerable resistance to frost.

4334. BAINES, R. C., AND OTHERS.
Factors influencing control of the citrus nematode in the field with D-D.
Hilgardia, 1959, 29: 359-81, bibl. 10, illus.

The vertical diffusion pattern and efficacy of D-D were determined in Yolo loam and silt loam soils under field conditions. In a number of tests doses of 120 to 180 gal D-D per acre killed 100% of the citrus nematodes (*Tylenchulus semipenetrans*) in the top 4 to 5 ft. of soil. The application of up to 18-acre-inches of water 7 days after D-D application greatly increased control. Applications of larger quantities of water, a shorter time after the D-D, decreased control in the top foot of soil. Soil moisture between the wilting point and field capacity had little effect on the diffusion of D-D in 2 fine textured Yolo loam soils. Wetting the surface foot of soil after D-D had been placed 9 or 14 in. deep did not improve control above that obtained by thorough tillage and rolling of the surface soil. Slightly superior control of the citrus nematode occurred when 120 gal. D-D per

acre were applied in November than in March or July. Superior control was obtained when 120 gal. D-D per acre were applied. 12 in deep than when it was applied 9 in. deep by a tractor applicator. The control of the citrus nematode in the surface foot of soil decreased when depth of placement was increased from 12 to 36 in. in a soil which had been tilled shallowly. However, control at lower depths improved with increased depth of injection in this soil. [From authors' summary.]

4335. SUIT, R. F., HANKS, R. W., AND TARJAN, A. C.
Control of spreading decline of citrus.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 219-22.

Of 19 chemicals tested only one, 1,2-dibromo-3-chloropropane, was not phytotoxic and gave some control of *Radolphus similis*. In field experiments, in which the compound was applied to the soil around infested trees at rates of 2, 3 or 4 gal. per acre every 4 months, the best treatment reduced nematode populations by as much as 85% at some sampling dates, though the trees have not shown any renewed growth.

4336. ANON.
Fruit fly.
Citrus News, 1959, 35: 107.

Notes on the release of 4 *Opius* species to parasitize Mediterranean and Queensland fruit flies.

4337. FRÉZAL, P.
 Essai de lutte généralisée contre la mouche méditerranéenne (*Ceratitis capitata* Wied.) à l'aide d'appâts insecticides. (An experiment on extended control measures against the Mediterranean fruit fly (*Ceratitis capitata*) using insecticidal baits.)
Ann. Épiphyt., 1960, 11: 5-33, bibl. 3.

The experiments were carried out over large and small areas in Algeria, planted with several orange varieties, to test the hypothesis that the success of poisoned baits against this pest depended on their application over a large and continuous area. Mixtures of malathion with various hydrolysed proteins were applied by helicopter as soon as the earliest orange varieties showed signs of ripening, and at intervals of approximately 10-12 days, depending on the degree of infestation indicated by traps. In spite of heavy attacks in the surrounding areas, only 0.059% of the fruit in the large, and 1.16% of that in the small experimental area was affected, even though the crops consisted mainly of the highly susceptible varieties Clementine and Thomson Navel. In previous years, before baits were used, the lowest proportion of punctured fruit was 2% following DDT treatment, which was more costly than the above, but had the advantage of requiring only half the number of applications.

4338. YASUMATSU, K., AND NAGATOMI, A.
Studies on the control of *Dacus (Tetradacus) tsuneonis* Miyake (Diptera: Trypetidae). I. Some fundamental and biological investigations essential for its control. [Japanese, with English summary 2 pp.]
 YASUMATSU, K., AND NAKAO, S.
Idem. II. Establishment of an economically effective method for its control. [Japanese, with English summary 2 pp.]

Sci. Bull. Fac. Agric. Univ. Kyushu, 1959, 17: 129-46, bibl. 35 and 147-66, bibl. 47, illus.

This citrus fruit fly feeds on honeydew deposited by other insects and is known to leave citrus groves in the hottest part of the day for the cooler wild vegetation at the borders of the grove. Methods of control suggested are the eradication of the species supplying honeydew or the application of insecticides just before the flies re-invade the groves in the afternoon. The application of insecticide to the wild plants is also suggested.

In the second paper the use of a tartar emetic bait-spray is recommended, applied twice with an interval of about 10 days. These sprays are cheap, non-toxic to warm blooded animals and harmless to natural predators. The best formula was: tartar emetic 8 g., white sugar 40 g. and water 1.8 kg.; this amount was applied to 9.9 acres.

4339. ELMER, H. S.
Evaluation of insecticides for control of Fuller rose beetle on citrus in California.
J. econ. Ent., 1960, 53: 164-5, bibl. 1.

Field tests with insecticides known to be toxic to the Fuller rose beetle (*Pantomorus godmani*) indicated a problem in timing and in the persistence of residues, since they eliminated the beetle for only part of the year. In greenhouse tests dieldrin and Guthion sprayed onto citrus seedlings at 1, 2, and 4 oz. per 100 gal. were toxic to a succession of freshly released adult beetles for from 6-7 to 9-10 weeks.—Univ. Calif., Riverside.

4340. PRETORIUS, A.
Leafhoppers, a pest at Koster in the Western Transvaal.

Citrus Gr., 1960, No. 313, pp. 17-18, illus.

Blemish due to *Empoasca* sp. can be prevented by ensuring that other host plants such as cowpeas, potatoes and cotton are not grown in the vicinity of citrus orchards, or by dusting the host plants when the hoppers appear with 5% DDT, 5% malathion or 2% parathion. Sprays used for scale control applied at petal fall will control leaf hoppers on the trees for a considerable period.

4341. (BOTHAM, J. R.)
Light-brown apple moth.
Circ. Murray Citrus Grs' co-op Ass., reprinted in *Citrus News*, 1959, 35: 111.

Controlled on citrus in Australia with 0.05-0.1% DDD or TDE sprays in late October-early November.

4342. VESSIA, R.
 La tignola degli agrumi. (The citrus moth.)
 [French summary 7 lines.]
Frutticoltura, 1960, 22: 49-59, illus.

On the island of Procida (Bay of Naples) *Prays citri* was successfully controlled on lemons by Nicol (a nicotine product), sprayed at 1 kg./100 l. within an hour of mixing, and also by a mixture of 300 g. of nicotine sulphate and 2 kg. of soap in 100 l. The trees were treated towards the end of May and twice in June, and 50-70% of the flowers were saved, as against a 90-100% loss from untreated trees. Results with oranges were almost equally satisfactory, but their earlier flowering meant that temperatures were rather low for treatment, which needs a minimum of 18-19°C. and should not be attempted above 30°C. because of scorch risk. Lead arsenate and parathion were abandoned because of their high toxicity to pollinating insects.

4343. KING, J. R.
Control of citrus insects and mites in the Indian River area.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 215-17, illus.

Rust mite (*Phyllocoptura oleivora*): Grapefruit trees sprayed 4 times with zineb 65% w.p. at 1 lb. per 100 gal. or wettable sulphur at 10 lb. per 100 gal. retained more foliage and had a better appearance through the winter than those sprayed with chlorobenzilate or left unsprayed. **Broad mite (*Hemitarsonemus latus*):** Of 15 acaricides tested on potted citrus seedlings 10 lb. of wettable sulphur per 100 gal. or 5 lb. of wettable sulphur plus 1 gal. of lime-sulphur per 100 gal. gave the best control. **Fuller rose weevil (*Pantomorus godmani*):** Good control was obtained with single or split applications of granular aldrin, dieldrin or heptachlor [see also *H.A.*, 29: 2861].

4344. GRIFFITHS, J. T.
Results from the use of zineb in citrus groves during the 1957 and 1958 growing seasons.
Fla Ent., 1959, 42: 85-91, from *Biol. Abstr.*, Sect. E, 1960, 35, Abstr. 17,335

In all but a few groves where it was tried, zineb was found effective in rust mite control. Excellent results were obtained in old orange groves with dosages as low as 5 lb./acre, applied after flowering. Following a 2nd application at summer scalcide time, many trees required no further spraying until post-bloom time in the following year. In some cases, however, on trees treated with sulphur combinations at post-bloom time, populations of rust mites developed to a high level by midsummer,

and on such trees zineb, at the dosages employed, failed to control the mites. This was particularly true on grapefruit clusters inside the trees. Combinations of zineb and wettable sulphur may be practicable at some times of the year.—Eloise Groves Ass., Winter Haven. Fla.

4345. HELY, P. C.

Scales: problems of improved control of insect pests of citrus in different parts of New South Wales.

Citrus News, 1959, 35: 69, 73.

White oil sprays in mid-February are recommended against red and yellow scale. Where initial infestations are high an earlier additional spray is required. Parathion (0.1%), malathion (0.2%) or combinations of parathion (0.05%) and white oil (1:80), or malathion (0.1%) and white oil (1:80) were as effective as white oil alone but no better. To control white louse scale the best spray is lime-sulphur, but this may cause leaf fall. Parathion or dispersible sulphur with bordeaux mixture at petal-fall checks the infestation. Combinations of these materials which are also effective against brown scales [see also *H.A.*, 30: 2766] and purple scales are also described.—N.S.W. Dep. Agric.

4346. THOMPSON, W. L., AND JOHNSON, R. B.

Chemical control of scales and related insects infesting citrus.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 227-8.

Purple scale (*Lepidosaphes beekii*) was controlled by the following treatments, listed in descending order of effectiveness: 0.15 lb. (technical) parathion per 100 gal. + 0.7% oil; 1.3% oil; 0.75 lb. (technical) malathion + 0.7% oil; 0.75 lb. malathion + 0.5% oil; 0.5 lb. malathion + 0.7% oil; 0.5 lb. malathion + 0.5% oil; and 0.5 lb. ethion + 0.5% oil. On tangerine leaves the control of purple scales and chaff scales (*Parlatoria pergandei*) with 1 lb. malathion, 0.6 lb. malathion + 0.7% oil, 0.6 lb. malathion + 0.5% oil and with 1% oil was similar to that obtained with 0.25 lb. parathion.

4347. KING, J. R., THOMPSON, W. L., AND KAHL, W. T.

Improved machinery for citrus production.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 204-7, illus.

An air-directing attachment on a sprayer improved coverage.

Citrus—fruit handling, storage and by-products.

(See also 4296)

4348. HAYWARD, F. W., AND GRIERSON, W.

Color-adding and protective coating processes for citrus fruits.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 218-19.

An annatto dye gave oranges a fair but not uniform colour. Several waxes, resins and other agents showed promise as alternative ingredients for improving the fungicidal water wax Lake Alfred 101A. [For earlier work, see *H.A.*, 29: 837.]

4349. BLOOMFIELD, J.

The half-dump for easier and better fruit packing.

J. Agric. W. Aust., 1960, 1(4th Ser.): 31-2, illus.

The half-dump case has become popular for citrus because of its ease of filling, handling and stacking. This container has also been found suitable for high grade, large Comice pears.

4350. BARRETT, R. J.

Cartons.

Citrus News, 1959, 35: 115.

Fibre board containers for citrus.

Fruit World, Melbourne, 1959, 60(11): 23.

The author quotes a communication from the Israel Citrus Marketing Board to the effect that, under their marketing conditions, cardboard containers are not satisfactory. Atmospheric humidity, condensation, sweating of the fruit and rain while loading or unloading may weaken the cardboard and thus make high stacking impossible.

4351. (WINSTON, J. R., CUBBEDGE, R. H., AND KAUFMAN, J.)

Shipping Florida citrus fruit in wirebound crates and fiberboard cartons.

Agric. Mktg. 1959, 4(12): 11, illus.

Both oranges and grapefruit showed negligible rind breakdown or decay in transit from Florida to New York when packed in wirebound crates that were loaded so as to provide horizontal air channels, or in fibreboard cartons that were stacked to provide zigzag vertical air channels.

4352. WINSTON, J. R., AND CUBBEDGE, R. H.

Export shipping tests to Europe with Florida citrus fruit.

Mktg Res. Rep. U.S. Dep. Agric. 321, 1959, pp. 43, illus., 25 cts.

Rind breakdown was worse in grapefruit shipped in a refrigerated hold than in a ventilated hold. Artificial colouring of oranges induced rind breakdown. Treating the fruit with sodium orthophenylphenate-hexamine and the use of diphenyl treated wraps, liners or cartons reduced decay. Under some conditions diphenyl increased rind breakdown. Recommendations based on simulated shipping tests are that oranges should be precooled to below 40°F. as rapidly as possible after packing and protected from warming while loading; also that temperatures in ships' holds should be maintained at about 35°F. for oranges and 50°F. for grapefruit.

4353. RYGG, G. L., AND HARVEY, E. M.
Storage behavior of lemons from the desert areas of Arizona and California.
Mktg. Res. Rep. U.S. Dep. Agric. **310**, 1959, pp. 12.

Lemons were examined before storage and at monthly intervals during 7 months' storage at 58°–60°F. and 89–91% R.H. and were found to lose weight at the rate of 2–3% per month. Villafranca lemons lost weight less rapidly than Eureka and Lisbon lemons but decayed more rapidly. Decay was low in dark green fruit and was related to maturity, the highest rate of decay being found in tree-ripe fruit. The green rind changed to pale green or yellow in 1 month and most fruits were bright lemon yellow in 3 months, slight bronzing becoming prominent after 4–5 months. Loss of firmness became noticeable after 3 months and the volume of juice rose from 40–45% of fruit volume at harvest to 45–50% after 1 to 2 months' storage. The acid concentration decreased during storage and was lower in tree-ripe fruit. The ascorbic acid content remained nearly constant and was equal in the 3 varieties, though the concentration in small immature Lisbon lemons was higher than that in larger, more mature lemons. Equal concentrations of ascorbic acid were found in Eureka lemons at 4 stages of maturity. A decrease in the weight of the rind was noted in the first month of storage, but subsequent decreases were small.

4354. ECKERT, J. W., AND OTHERS.
Control of citrus fruit decay with dichloro-isocyanuric acid.
 Abstr. in *Phytopathology*, 1960, **50**: 83-4.

Paper sheets impregnated with sodium dichloro-isocyanurate (NaDCCA) [see also *H.A.*, 30: 1185] reduced decay in oranges artificially inoculated with *Penicillium digitatum*. Sheets (11 × 17 in.) were impregnated with 0.41 g., 0.96 g., 2.20 g. or 3.12 g. NaDCCA. Two equal-concentration sheets were placed in each fibreboard fruit carton. Inoculated fruits were evaluated for decay and fungus sporulation at the end of a 15-day simulated market-handling period. All NaDCCA treatment levels reduced decay more than 50% below that of untreated control fruit. In addition, treatment with NaDCCA at 2.20 g. or 3.12 g. per sheet greatly suppressed fungus sporulation on the surface of decayed fruit. The evolution rate of chlorinous volatile material from moistened NaDCCA-impregnated sheets is accelerated by ammonium salts. Combination formulations, consisting of paired NaDCCA and (NH₄)₂SO₄ sheets, provided more effective decay control than NaDCCA sheets alone. This combination, however, usually produced fruit injury and did not control sporulation over the 15-day test period. Vapour-phase spectrophotometry and chemical analysis of trapped effluents indicate that NCl₃ is the principal volatile material

arising from moistened NaDCCA-impregnated sheets.

4355. DEWOLFE, T. A., ERICKSON, L. C., AND BRANNAMAN, B. L.
Retardation of alternaria rot in stored lemons with 2,4-D.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 367-71, bibl. 5.

Freshly picked immature lemons showed resistance to the growth of the fungus *Alternaria citri* in the albedo, while ripe ones did not. Resistance was lost during storage, although treatment of the fruit with 2,4-D before storage delayed the loss. Once *Alternaria* gained entrance to the albedo its growth was not checked for long by 2,4-D. Decay of lemons caused by the entrance of *Alternaria* through the button was greatly delayed by treating the fruit with 2,4-D before storage. Buttons of 2,4-D-treated fruit remained green during storage, but buttons of non-treated fruit deteriorated. When non-treated fruits were sorted according to the colour of their buttons after about 3 months' storage, it was found that the greater the deterioration of the button, the greater was the number of fruits infected with *Alternaria*. Treatment of the fruit with 2,4-D delayed visible signs of *Alternaria* in the vascular tissue of the fruit under the button. [From authors summary.]—Univ. Calif., Riverside.

4356. DOUGHERTY, M. H.
Production and use of activated citrus sludge.
A.R. Fla agric. Exp. Stats, 1957-58, pp. 244-5.
 As an animal feed supplement.

Dates.

4357. NIXON, R. W.
Growing dates in the United States.
Agric. Inf. Bull. U.S. Dep. Agric. **207**, 1959, pp. 50, bibl. 110, illus.

This bulletin is a revision of a previous Circular [see *H.A.*, 22: 918]. It is intended for inexperienced growers and students and provides up-to-date information on all aspects of date growing in the United States, where production has increased from 1 m. lb. in 1926 to more than 48 m. lb. in 1955.

4358. CALCAT, A.
Diseases and pests of date palm in the Sahara and North Africa.
FAO Plant Prot. Bull., 1959, **8**: 5-10, bibl. 1, illus.

No effective control is known for *Fusarium oxysporum*, but lime-sulphur or bordeaux sprays or lime/copper sulphate dust are recommended for use against the inflorescence rot caused by *Mauginiella scaetiae*. As all the chemical methods for controlling date palm scale (*Parlatoria blanchardi*) are costly and involve risks, the use of predators (*Cybocephalus* spp., *Pharoscyrmus* spp., etc.) is suggested. The date mite (*Paratetranychus simplex*),

however, is vulnerable to lime-sulphur dust. Larval damage to ripe dates can be prevented by spraying the clusters with lindane, and storage pests can be eliminated by fumigation with methyl bromide or ethylene oxide.

4359. RINDERKNECHT, H.

Free amino-acid pattern of dates in relation to their darkening during maturation and storage.

Food Res., 1959, **24**: 298-304, bibl. 19, from abstr. in *J. Sci. Food Agric.*, 1960 **11**: i-87.

Changes in the free amino-acid pattern during ripening were studied by paper chromatography, with particular reference to the possibility of amino-acid participation in browning reactions during normal and excessive pigment formation. In the free amino-acids in the ripening fruit there was a sudden sharp rise of glutamine, arginine and glutathione during the red phase and then a decline during the brown stage of maturation. Decrease in pH paralleled the progressive darkening. The possibility of a Maillard-type interaction between amino-acids and a phloroglucinol derivative is discussed. In addition two other amino-acids of special interest occurring in dates are discussed, viz., citruline and 5-hydroxypipicolic acid.

Litchis.

4360. YOUNG, T. W.

Lychee.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 354-6.

Source and level of N had little effect on tree growth, but in a severe frost trees given sulphate of ammonia showed greater cold tolerance than those receiving nitrates. Iron chlorosis was controlled by NaFe-DPTA. Both branch girdling and banding with heavy butyl rubber bands increased blossoming and yields. The latter method appeared safer. [See also *H.A.*, 29: 846.]

4361. DENNISON, R. A., AND HALL, C. B.

Studies on the handling and preservation of lychees.

A.R. Fla agric. Exp. Stats, 1957-58, p. 114.

Mould development on fresh fruits was retarded by dipping them in a 0.5 to 1.5% solution of the sodium salt of dehydroacetic acid.

Olives.

(See also 3498, 3548, 4380.)

4362. GERARDUZZI, J. B.

Método rápido para estimar los daños de granizo en plantaciones de olivo. (A rapid method of estimating hail injury in olive groves.)

Bol. Oleic. int. 1959, **9**(52): 1-7, illus.

After a hailstorm the following data were collected from 3 or more trees of each variety present: the area of soil below the crown; the number of fruits fallen on a representative sq. m.; the average

weight of a ripe fruit of each variety. The volumes and weights (maximum, minimum and average) are tabulated for fruits of 9 olive varieties.

4363. FAHMY, I., AND NASRALLAH, S.

Changes in macro-nutrient elements of Souri olive leaves in alternate bearing years.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 372-7, bibl. 9.

The N, P, K, Mg and Ca contents of Souri olive leaves were determined monthly during the bearing year of 1956 and the non-bearing year of 1957 under conditions prevailing in the Lebanese Republic. The fluctuations in leaf N were related to the reproductive condition of the tree. It was low at the period of fruit maturation and ripening and gradually accumulated in the leaf until the following summer of the off-year when a significant build-up was noticeable. Thereafter no real changes took place. P was present in the smallest amount of any of the 5 elements measured and showed no difference during either year of study. This may have been due to P deficiency. The seasonal changes in leaf K were similar to those of N. Ca was the most abundant macro-nutrient in the leaf expressed as a percentage of dry weight. Ca and Mg accumulated in the leaf with age, regardless of the fruiting or vegetative condition of the tree. There was a marked linear correlation between Ca and Mg, but they were inversely related to N and K. [From authors' summary.]—Amer. Univ. Beirut.

4364. BONIFORTI, L., AND DORETTI, M.

Determination of aldrin and dieldrin residues in olive oil.

R. C. Ist Sup. Sanit., 1959, **22**: 189-200, from *Anal. Abstr.*, 1960, **7**, Abstr. 792.

4365. VASSILIOU, A. A., ADAM, N., AND DADINAKI-ROUSSOPOULOU, D.

Méthodes de détermination des résidus de l'insecticide Rogor dans l'huile d'olives et les fruits de l'olivier. (Methods of determining Rogor residues in olive oil and olives.)

Ann. Inst. phytopath. Benaki, 1959, **2**: 12-13, bibl. 5.

Calculated from the P content of the extract.

Passion fruit.

(See 3102, 4286.)

Persimmons.

(See also 4287.)

4366. ATSUMI, K., AND NAKAMURA, M.

Physiological and ecological studies on the calyx of Japanese persimmon fruit. I. Development of fruit affected by removal of the calyx lobes. [Japanese, with English summary ½ p.]

J. hort. Ass. Japan, 1959, **28**: 170-6, bibl. 17.

Removing the calyx lobes was most detrimental in the early stages of fruit development and became gradually less important as fruit enlargement proceeded. It appeared that the lobes, even if incomplete, have a considerable effect on the development of young fruits and in preventing their drop. Even when all the leaves on a bearing branch were removed, provided that the calyx lobes were present, the fruits developed. When fruit development was checked as a result of calyx lobe removal, seed growth within the fruit was also checked and a carbohydrate shortage was found.

4367. HAZARADZE, E. P.

Phomopsis or canker of persimmon (*Phomopsis diospyri* Bong.) in the Georgian S.S.R. [Georgian, with Russian summary.]

Tr. In-ta Zašči. Rast. AN GruzSSR, 1957, 12: 153-75, from *Ref. Ž. (Biol.)*, 1958, No. 20, Abstr. 91,999.

P. diospyri causes desiccation of branches and dry rot of the fruit. The calyx of the shed fruit remains on the tree as a source of infection, whence the branches become infected via the fruit stalk. On older branches and sometimes on the stem, canker-like injuries appear in the form of depressions with 1-2 longitudinal fissures. The leaves, although seldom affected, sometimes have brown spots on their edges. The disease first appears in May on newly set fruit. Good control has been obtained by spraying with 1% TMTD or 1% bordeaux.

Pomegranates.

4368. SUTO, I.

Anatomical observations of stoneless pomegranates.

Seiken Zihō, 1958, 9: 58-60, from *Biol. Abstr., Sect. D*, 1959, 34, Abstr. 11,357.

Pomegranates collected in Afghanistan contain seeds, the outer integument of which is lignified only near the embryo.—Kihara Inst. biol. Res., Yokohama.

Tung.

4369. POTTER, G.

The domestic tung industry. I. Production and improvement of the tung tree.

Econ. Bot., 1959, 13: 328-42, bibl. 35, illus.

A description is given of the ecology, varieties, improvement, cultural practices, effects of physical environmental factors, nutrition, fertilization, method of harvesting and pests and diseases of *Aleurites fordii*. *Mycosphaerella* (*Cercospora*) *aleuritidis* causes a leaf spot disease which can be controlled by spraying with bordeaux, but, as this is not economically feasible, research is in progress to breed *Mycosphaerella*-resistant varieties and also to determine whether the fungus can be controlled

by oil mists which are relatively inexpensive. Tung requires a long period of winter chilling, and a plentiful supply of moisture, and it is very sensitive to weed growth in the orchard. Trees respond to N fertilizer and, if they set a heavy crop, require K dressings as well. Spring frosts are a serious hazard.—U.S.D.A., Bogalusa, La.

4370. MERRILL, S., JR., NEFF, M. S., AND LAGASSÉ, F. S.

Resistance in tung clones and seedling progenies to *Mycosphaerella aleuritidis*.

Proc. Amer. Soc. hort. Sci., 1959, 74: 232-5, bibl. 6.

Observations made preliminary to a breeding programme showed that progenies of Lampton and Isabel are very susceptible to leaf spot, whereas progenies of Lamont, F-554, G-37 and M-67 are more resistant than any of the varieties at present recommended for commercial planting.—U.S. Dep. Agric.

4371. LAGASSÉ, F. S., SHEAR, C. B., AND BARROWS, H. L.

U.S. Field Laboratory for Tung Investigations.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 120-2.

Selection for resistance to *Cercospora* leaf spot: The selections G-37, M-1 and G-53 and *Aleurites fordii* crosses with F-174 and F-36 were found to show good resistance. **Cultural and nutritional studies:** In a sand culture experiment, using 3 levels of N, Ca and B, increasing N increased leaf N and P but reduced leaf K. At a low level of B increasing Ca increased leaf K, but at higher B levels it reduced leaf K. The Ca and B contents of the leaves were influenced only by the level of Ca and B supplied. P, K and Mg accumulated in much higher concentrations in the feeder roots than in the leaves, whereas Ca and B accumulated more in the leaves. An experiment with 10-year-old trees on the source and level of K indicated that the only effect on leaf composition was due to the source of K. There was a trend towards higher yields with a slowly available source Dura-K, and a higher oil content with the readily available source muriate of potash. In 11-year-old seedlings increasing levels of N and K significantly increased the N and K contents of the leaves but had no significant effect on the P, Ca or Mg contents. [For earlier work, see *H.A.*, 29: 856.]

4372. SITTON, B. G., POTTER, G. F., AND KILBY, W. W.

Fertilizer rates compared in extensive tung studies.

Miss. Fm Res., 1959, 22(11): 5.

Based on the results of a number of experiments carried out between 1946 and 1958 the recommended maximum application of N is 125 lb., of P_2O_5 60 lb. and of K_2O 150 lb. per acre.

4373. SITTON, B. G., AND OTHERS.

Effect of mulch, nitrogen and potassium fertilizers on Savannah soil and tung trees.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 236-44, bibl. 23.

The effects of cultivation and mulch, 2 levels of N, and 3 levels of muriate of potash on soil cations, and on tung trees in a Savannah very fine sandy loam in Pearl River County, Miss., were studied over the period 1946 to 1957, inclusive. In comparison with cultivation, the mulch of alyce clover and native grass increased exchangeable K in the 0-6 in., 6-12 in., and 12-18 in. depths and exchangeable Mg in the 0-6 in. depth. It also increased leaf N, P and K and yield of fruit. The high level of N increased leaf Mg and decreased leaf K. The increments of applied K increased exchangeable K and leaf K but decreased exchangeable Ca, leaf Ca, and leaf Mg. The most important finding was that K uptake by mulched trees was increased substantially without seriously decreasing Mg uptake. This may be due to the fact that in comparison with the cultivated trees the mulched trees had more extensive root systems in the 0-6 in. soil layer, which was better aerated and contained more exchangeable Mg. [Authors' summary.]—U.S. Dep. Agric.

4374. CRANE, H. L., BARROWS, H. L., AND SITTON, B. G.

Effect of fertilizers on potassium content of tung hulls.

Proc. Amer. Soc. hort. Sci., 1959, **74**: 245-7, bibl. 5.

The percentage of K in the hulls and in the whole fruit, and the weight of K per fruit, increased significantly with increasing levels of applied K. The level of applied N did not significantly affect the percentage of K in the hulls, but the percentage of K in the whole fruit and the weight of K per fruit declined significantly with increasing levels of applied N.—U.S. Dep. Agric.

4375. GOLDBLATT, L. A.

The tung industry. II. Processing and utilization.

Econ. Bot., 1959, **13**: 343-64, bibl. 55.

Descriptions are given of milling, hulling, drying, grinding, pressing and the solvent extraction of tung oil, together with details of methods of storage, specifications, medicinal properties, chemical composition and the uses of tung oil and its by-products.—S. reg. Res. Lab., New Orleans, La.

TROPICAL FRUIT AND PLANTATION CROPS

General.

(See also 3702, 4606, 4616, 4620, 4632, 4634.)

4376. DA SILVA TEIXEIRA, A. J., AND GRANDVAUX BARBOSA, L. A.

A agricultura do arquipélago de Cabo verde. (Agriculture in the Cape Verde Islands.)

[English and French summaries 4½ and 5 pp.]

Mem. Jta Invest. Ultramar **2**, Lisbon, 1958, pp. 178, bibl. pp. 6, illus, maps.

This comprehensive work includes accounts of growing sugar cane, coffee, tobacco and bananas, with additional brief reference to tropical fruits and imported temperate fruits and vegetables. These crops are limited to the areas of sufficient rainfall or available irrigation water. Much of the area, however, is semi-arid, and here the crops include beans and related edible legumes, cassava, the oil-seed plants *Jatropha curcas* and *Ricinus communis*, and the fibre plants *Furcraea foetida* and *Calotropis syriaca* (silk-cotton tree).

4377. ASOCIACIÓN COLOMBIANA DE INGENIEROS AGRÓNOMOS.

El desarrollo de la agricultura en Colombia durante quince años, 1945-1959. (The development of agriculture in Colombia during the 15-year period 1945-1959.)

Agric. trop. Bogotá, 1959, **15**: 715-818, illus.

This special number contains an introduction on agricultural research in Colombia, and 18 brief articles on individual crops, including peas,

bananas and plantains, cacao, coffee, sugar cane, sisal, beans, fruit trees, vegetables, oil crops and tobacco. Additional short notes are given on entomology and extension services.

4378. BELIEN, J. L.

L'agriculture au nord du territoire de Lubutu en District du Maniema. Réflexions sur son développement. (Agriculture in the north of the Lubutu territory in Maniema District. Reflections on its development.)

[Flemish summary 1½ pp.]

Bull. agric. Congo belge, 1959, **50**: 1457-73, illus.

Including coffee, cacao, oil palms and rubber.

4379. MOLLE, A. L., AND LUTTGENS, M. J. W.

État des connaissances pratiques en matière de fumure des principales spéculations végétales. (The state of present knowledge on the manuring of the principal crops.) [Flemish summary 3½ pp.]

Bull. agric. Congo belge, 1959, **50**: 1207-44, bibl. 5.

Notes on mineral fertilization, placement, organic manures, trace elements and liming are followed by recommendations for the mineral fertilization of tobacco, oil palms, coffee, cacao and rubber in different parts of the Congo. The formulae, which follow the ionic notation of M. V. Homès, are based on 4 different ratios of the anions NO_3^- , SO_4^{--} and PO_4^{---} , 4 of the cations K^+ , Ca^{++}

and Mg^{++} and 2 ratios between these anions and these cations plus 2.5% of a mixture containing B, Mn, Cu, Zn and Mo, applied at a given rate per ha. For example, the formula for Sumatra tobacco in the Kaniama region is $50 NO_3^-$, $30 SO_4^{--}$, $20 PO_4^{---}$: $35 K^+$, $30 Ca^{++}$, $35 Mg^{++}$ at an anion-cation ratio of 1.9 applied at 500–800 kg. per ha. Some of the recommendations are provisional, being based on as yet insufficient data.

4380. PRÉVOT, P.

Bases du diagnostic foliaire, ses résultats et sa généralisation. (Leaf analysis: its basis, results and general use.) [Flemish summary 1½ pp.]

Bull. agric. Congo belge, 1959, 50: 1475-502, illus.

The crops discussed include: oil palm, sampling, Mn, K, K:Ca:Mg; olive, N:P; coconut, K:Na; and coffee, K:Ca:Mg.

4381. ALLEN, G. R.

Short-term variations in retailing margins on fruits in East Pakistan.

Fm Econ., Oxf., 1959, 9: 259-66, bibl. 4.

An economic analysis of data from 5 markets over a 5-year period.

Areca palms.

4382. BAVAPPA, K. V. A., AND MURTHY, K. N.

Occurrence of chlorophyll deficiency in arecanut (*Areca catechu* Linn.).

Arecanut J., 1959, 10: 53-7, bibl. 4, illus.

Five types, from pure albino plants to those with a simple leaf stripe, are described. The occurrence of these variegated forms range from 0.028 to 0.216% in seedlings. Pure yellow or white seedlings do not survive.

4383. NAIDU, G. V. B.

A peculiarity of stem structure in arecanut.

Arecanut J., 1959, 10: 58-60, illus.

Plants having longitudinal fissures, 4–9 in. long and up to $\frac{3}{4}$ in. deep, running downwards from the 7th node, are described. The condition is apparently not deleterious and the cause is unknown.

4384. PILLAI, G. B., AND KURIAN, C.

New light on areca's pest enemies.

Indian Fmg., 1959, 9(8): 5-7, illus.

Insects which damage the arecanut crop are described, together with control measures: white ants—dust with BHC, chlordane or aldrin; thrips—spray contact insecticide; capsids—spray fish oil rosin soap 1 lb./8 gal.; aphids—spray inflorescence with contact insecticide; mealy bugs and scale insects—spray with malathion, parathion or chlordane; leaf-eating caterpillars—spray 0.2% DDT (1 lb. 50% w.p./25 gal.); bagworms—spray 0.2% DDT or BHC; beetles—spray BHC suspension or dust; weevils—inject 1% "Pyrocon-E".

The control of mites and mammalian pests is also described.—Cent. Coconut Res. Stat., Kayangulam.

Bananas and abaca.

(See also 3196, 3668, 3669, 4377, 4619, 4623, 4629.)

4385. SHEPHERD, K.

Seed fertility of edible bananas.

J. hort. Sci., 1960, 35: 6-20, bibl. 15.

Female fertility was analysed in a wide range of banana cultivars, mainly triploids. Comparisons using the pollen of two sub-species of *Musa acuminata* and of *M. balbisiana* revealed striking and sometimes unexpected differences in fertility, in distribution of seeds within fruits and in seedling ploidy. A number of clones were shown to be more fertile when pollinated prior to flower opening. The origins of viable embryo-sacs and the causes of sterility are discussed. [From author's summary.] —I.C.T.A., Trinidad.

4386. GOWDER, R. B., SAMBANDAMURTHY, S., AND APPAIYAN, M. C.

Season of planting in banana.

From abstr. in *Madras agric. J.*, 1960, 47: 37-8.

The highest average yield of fruit was obtained from suckers planted in October (24.6 lb.) and the lowest from those planted in June (17.4 lb.). The variety Monthan significantly outyielded Rasthali.—Cent. Banana Res. Stat., Aduthurai.

4387. BAGHDADI, H., MINESSY, F., AND KELEG, F.

Banana yield in relation to planting distances and depths, time of maturity and flower bud removal.

Alexandria J. agric. Res., 1959, 7(1): 63-75, from *Document. Bull. nat. Res. Cent. Cairo*, 1959, 5, Abstr. 5-100,930.

The effect of planting depth on bunch weight was uncertain. Bunch weight was considerably lower in the first, and somewhat lower in the second year from 1 m. than from 2 or 3 m. spacing. When planted 3 m. apart, the presence of 2 or 3 fruiting plants per hole did not give lower bunch weights than with 1 plant per hole. The time of maturity was not affected by depth of planting, spacing or the number of plants up to 3 per hole. Early removal of the flower bud did not increase bunch weight, but advanced maturity by up to 1 month.

4388. BUTLER, A. F.

Fertilizer experiment with the Gros Michel banana.

Trop. Agriculture Trin., 1960, 37: 31-50, bibl. 11, illus.

Fertilizer experiments in Jamaica over a 13-year period and further studies in Honduras over a 3-year period indicate that economic response to fertilizing can be expected only from the use of

N. Potassium and P, alone and in combination, in conjunction with N, produced no statistically significant increase in production over N used alone. Similarly, the minor elements Mn, B, Fe and Zn produced no significant production increase and, in some cases, exerted a negative effect. [Author's summary.]—Tela Railroad Co., La Lima, Honduras.

4389. SHMUELI, E., AND OTHERS.

Prevention of frost damage in banana groves. First report. [Hebrew, with English summary 2 pp.]

Spec. Bull. Israel Minist. Agric. 23, 1959, pp. 72, bibl. 16, illus.

An equation for predicting the minimum temperature to be expected was calculated from 20 years' meteorological data. Large temperature differences were noted between different parts of the banana plant, the coldest parts being the upper horizontal leaves. Frost damage occurred at temperatures of -1.5°C to -2.0°C . Artificial fog from 'Swingfog' generators gave $1-2^{\circ}\text{C}$. protection only when the R.H. was higher than 70%. Sprinkling with water at the rate of 1.9 mm./hr. gave protection from slight frosts, but up to 5.3 mm./hr was required to give protection from a temperature of -5.0°C . Chilling damage to banana leaves by low positive temperatures is described.

4390. CALPOUZOS, L., AND THEIS, T.

A simple method for estimating oil-mist deposit on banana leaves.

Trop. Agriculture Trin., 1960, 37: 51-2, bibl. 2, illus.

Pieces of white, glossy, medium or heavy weight paper with a clay-bearing calendar finish were dipped in a saturated solution of an oil-soluble dye in acetone and allowed to dry quickly. These cards could be clipped to banana leaves, and oil drops striking the surface made permanent light-coloured spots proportional in size to the original droplet diameter. The relationship between spot diameter and actual droplet size should be established for each type of oil to be used by microscope measurements of droplets deposited on glass slides.—U.S.D.A., Mayaguez, P.R.

4391. MARSHALL, K. C., AND ALEXANDER, M.

Competition between soil bacteria and fusarium.

Plant and Soil, 1960, 12: 143-53, bibl. 16, illus.

The phenomenon of competition has been characterized in liquid medium and sterile soil systems, using a variety of soil bacteria and *Fusarium oxysporum* f. *cubense* [the fungus causing panama disease of bananas] as test organisms. For most of the bacteria, suppression of the fungus was the result of a biologically induced N deficiency, this effect being reversed by the addition of excess inorganic N. High populations of competitors

were found in two soils of neutral pH, but no isolates competed in an acid loam. *Agrobacterium radiobacter* was able to compete when the loam was limed to about pH 6.6. Inhibition of the fungus by a number of gram-positive, spore-forming rods could not be accounted for in terms of competition for nutrients or by antibiotic production in artificial media. The competitive ability of *A. radiobacter* was found to be related to pH in acid and neutral environments but was correlated with texture, organic-matter content and total N in soils of intermediate pH. In all soils where inhibition occurred the competitive effect was overcome by additions of inorganic N. Excluding the group of *Bacillus* spp., the competitive ability of soil bacteria was related to the ability to develop in the absence of amino acids and growth factors but could not be correlated with growth rates of the bacteria in soil or liquid medium. It is suggested that competition for nutrients is a significant means of ecological control among members of the soil microflora and, together with competitive interactions for space and oxygen, may be the major factors governing the biological control of soil-borne fungi. [From authors' summary.]—Cornell Univ., Ithaca, N.Y.

4392. ELIAS, R.

A broca da bananeira. (**The banana beetle.**) *Rural, Rev. Soc. Rural Bras.*, 1959, 43(463): 51, illus., from *Trop. Abstr.*, 1960, 15, Abstr. h 1296.

In Brazil the varieties Congo, Java and Nanica show some resistance to *Cosmopolites sordidus*. Control measures include the immersion of planting material in water for 15 days, soil treatment with aldrin, the eradication of infested plants and poison baiting, using BCH- or chlordane-treated pieces of pseudostem.

4393. YUST, H. R.

Insect pests and fruit spotting of Gros Michel bananas in Ecuador.

FAO Plant Prot. Bull., 1959, 8: 13-18, bibl. 4.

The thrips *Palleothrips musae*, *Selenothrips rubrocinctus* and *Frankliniella parvula* cause fruit spotting, the aphid *Pentalonia nigronervosa* is responsible for water-soaked spotting near the attached end and interior surfaces, small bees of the genus *Trigona* produce black scars on the ridges, and the scales *Aspidiotus destructor* and *Selenaspidus articulatus* make the surface unsightly. No control measures are given.

4394. LAWSON, J. A.

Banana packing and waxing.

J. Agric. W. Aust., 1960, 1(4th Ser.): 41-5, illus.

Bananas dipped in a mixture of finely divided crystalline wax and blended paraffin wax, 1:3, emulsified in 3 times their volume of water plus a little detergent, keep longer, are less damaged.

by handling and are preferred by the customer. Advice on waxing and packing is given.

4395. LASERNA, G., BUENAVENTURA, J. S., AND CU, G. L.

Comparative study of the cellulose content of the trunks of different varieties of bananas.

Philipp. J. Sci., 1958 (issued 1959), **87**: 143-8, bibl. 6.

The pseudostems of 12 varieties of *Musa sapientum* and 1 variety of *M. errans* were divided into outer, middle and inner portions and analysed to test their suitability for paper making. Their moisture contents were satisfactory, but their ash contents and alkali solubility were high giving a low yield of cellulose and, consequently, of pulp. The fibres would yield pulp of moderate strength only, suitable for the manufacture of tissues and mimeograph stencils.

4396. PANCHO, J. V., AND CAPINPIN, J. M.
Cytotaxonomic study of the fiber-producing *Musa* in the Philippines. I. Chromosome numbers in the section *Australimusa*.

Philipp. Agric., 1959, **43**: 397-403, bibl. 11, illus.

Basic number is 10 with an atypical form with 21.

4397. CRUZ, E. E.
A comparative study on the different distances of planting abaca.

Philipp. J. Agric., 1956 (issued 1959), **21**: 1-8, illus.

The mean annual yields of marketable fibre over the period 1949-53 were 29.41 piculs/ha. for a spacing of 2.0×2.0 m., 27.52 for 2.5×2.5 m. and 25.44 for 3.0×3.0 m., but the differences were not statistically significant.

4398. LANUZA, E. A., AND OTHERS.
Progress report on the survey of weeds in Davao abaca plantations.

Philipp. J. Agric., 1956 (issued 1959), **21**: 17-29, bibl. 14.

Aimed at identifying alternate hosts of aphid vectors of mosaic.

4399. CAINITIC, C. U.
Abaca marketing practices in Compostela, Davao.

Philipp. Agric., 1959, **43**: 415-29, bibl. 5.

A survey covering farm sizes, incomes, varieties, marketing and transport.

Cacao.

(See also 4377-4379, 4609, 4617.)

4400. LIABEUF, J.
Les recherches cacaoyères à la Trinidad.
(**Cacao research in Trinidad**)
Café, Cacao, Thé, 1959, **3**: 127-33, illus.

A report on the work of the Imperial College of Tropical Agriculture and the Cocoa Board.

4401. PASCUAL, D. P., AND MANIPULA, N. C.
Cost of production of cacao per hectare in Manambulan, Davao City.

Philipp. J. Agric., 1957 (issued 1959), **22**: 97-105, bibl. 5.

By the end of the 3rd year each tree had cost ₱2.62 to establish and in the third year provided a return of ₱2.12. Full costings data are provided.

4402. CICIN, N. V., AND GUDKOV, V. P.
Greenhouse culture of the cacao tree. [Russian.]

Priroda, 1959, **48**(12): 100-2, illus.

In the Soviet subtropics.

4403. NAUNDORF, G.
Konservierung und Transport lebender Samen und Pflanzenteile des Kakaos. (**Preservation and transport of cacao seeds and of living parts of cacao plants.**) [English and Spanish summaries 17 and 21 lines.]

Gordian, 1959, **59**: 686-9, bibl. 8.

Of several media tested rice husks proved to be the most suitable for rooting cacao cuttings and for transporting them. Cacao seeds were kept in good condition for several weeks when mixed with charcoal. The disinfection of the seed is recommended. Budding material was kept fresh for one week by placing it in moist charcoal.

4404. ALFONSO HURTADO, C.
Contribución al estudio del sistema de propagación por injerto en el cacao. (**A contribution to the study of the technique of budding cacao.**)

Bol. trim. Exp. agropec. P.C.E.A., Lima, 1959, **8**(4): 2-5, bibl. 4.

Ringling the budwood 8 days before budding induced better ripening of the wood and resulted in a higher percentage take of the clone ICS-1 on Amazonian amelonado rootstocks than did defoliating the budwood 8 days before budding or using untreated budwood. There was no significant difference between the take of buds from defoliated and untreated budwood.—Estac. exp. agric. Tingo María.

4405. HARWOOD, L. W.
Cocoa planting.

Agric. J. Dep. Agric. Fiji, 1959, **29**: 65-75, illus.

Layout plans, including temporary and permanent shade, costings and practical advice on establishment.

4406. CORNWELL, P. B.
Some climatological observations on amelonado cacao.

Trop. Agriculture Trin., 1960, **37**: 67-71, bibl. 4, illus.

Minimum and maximum temperatures occurred between 3 and 6 a.m. and between 2 and 3 p.m.,

respectively. Temperatures at the top of the canopy, 19 ft. above ground level, exceeded those at ground level between 9 a.m. and 7 p.m. but were lower during the hours of darkness. Atmometer measurements of evaporation rates were compared in standing cacao and in a small clearing. In the clearing, the evaporation rate increased linearly with height, but among standing trees the canopy reduced evaporation considerably.—W.A.C.R.I., Tafo, Ghana.

4407. VAN HIMME, M.

Étude du système racinaire du cacaoyer.

(A study on the root system of cacao.)

[Flemish summary 4½ pp.]

Bull. agric. Congo belge, 1959, 50: 1541-600, bibl. 15, illus.

The development is discussed of the root systems of seedling cacao trees in relation to age, soil and yield and of trees arising from plagiotropic and orthotropic cuttings. In the relatively light soils of Yangambi the cacao root system is characterized by: asymmetrical distribution; a markedly superficial position of the lateral roots and rootlets; zones of root absorption comprising dense bunches of rootlets at a great distance from the trunk and generally associated with the humus layer and the litter; and a fairly large taproot reaching a depth of about a metre. It is concluded that: the superficial development of the laterals makes it necessary to protect the humus layer from desiccation by shading and mulch; strip weeding and cultivation are injurious; cacao requires a good soil structure if forking and twisting of the roots are to be avoided; spacing at 3.0 by 2.5 m. is optimal; plants derived from cuttings form satisfactory root systems; fertilizer should be applied under the crowns of trees up to 2 years old and broadcast in the lines of trees from 2 to 5-6 years old and in the inter-rows between trees over 6 years old.—Div. Café, Cacao, Yangambi.

4408. MCPAUL, J. W.

Notes on cocoa nutrition.

Agric. J. Dep. Agric. Fiji, 1959, 29: 99-104, bibl. 7, illus.

A simple outline stressing the value of organic manuring.

4409. WHARTON, A. L., AND BRUNT, A. A.

Galls of cacao in Ghana.

Commonw. phytopath. News, 1959, 5: 61-2, bibl. 6, illus.

A survey has shown cushion gall to be present in Ghana, widely spread but in small numbers. The etiology is at present obscure.—W.A.C.R.I., Tafo.

4410. HUTCHINS, L. M.

Transmission of cushion gall of cacao by means of tissue transplantation.

Comun. Turrialba 66, 1959, pp. 6, bibl. 3, illus.

In the case of "greenpoint" galls 9.7% of the 143

inoculations made succeeded in transferring the disease, but no success has yet been obtained with "flowery" gall inoculations.

4411. THOROLD, C. A.

Methods of controlling black-pod disease (caused by *Phytophthora palmivora*) of *Theobroma cacao* in Nigeria.

Ann. appl. Biol., 1959, 47: 708-15, bibl. 11.

Supplementary methods of controlling black-pod disease (*P. palmivora*) of cocoa in Nigeria are considered, because fungicide application is not always economic. There is no evidence that resistance occurs within the local population of amelonado-type trees. Although the percentage of diseased pods was greater with trees closely spaced (5 × 5 ft. to 8 × 8 ft.) than with widely spaced trees (10 × 10 ft. to 15 × 15 ft.), the closer spacings often gave more healthy pods per acre. Loss of pods from black-pod was decreased when trees were inspected frequently (alternate days) and infected pods were removed when showing the earliest symptoms. However, this procedure may not be economic, except when potential yields are relatively small (fewer than 12 pods per tree). Satisfactory control of black-pod was obtained with copper fungicides, applied with either hand-sprayers or a power-sprayer. The monetary return depends on yield level rather than on disease incidence or on spraying costs. It is recommended that spraying should be practised when the potential yield is 12 or more pods per tree. [Author's summary. See also *H.A.*, 28: 854.]—Dep. agric. Res., Nigeria.

4412. WHARTON, A. C., AND TURNER, P. D.

Phytophthora palmivora causing a leaf and stem blight of cocoa.

Commonw. phytopath. News, 1960, 6: 13, bibl. 2, illus.

Leaf blight and chupon die-back recorded in southern Ghana.

4413. HARWOOD, L. W.

Diseases of cocoa.

Agric. J. Dep. Agric. Fiji, 1959, 29: 96-8, bibl. 7.

Copper fungicides are recommended for the control of black pod, *Phytophthora palmivora*. No other disease has yet attained economic importance in Fiji.

4414. NAUNDORF, G.

Die sechs Übertragungsformen der Ceratostomella-Krankheit bei *Theobroma cacao* L. (Six ways of transmitting the ceratostomella disease of cacao.) [English and Spanish summaries 17 and 18 lines.]

Gordian, 1960, 59: 809-12, 849-50, bibl. 17, illus.

Blue rot (*Ceratostomella fimbriata*) and its importance in Colombia, Ecuador and Venezuela are discussed. *Xyleborus* spp. were shown to be active agents in its transmission. Of the chemicals tested for blue rot control urea foliage sprays and 8-oxyquinoline sulphate had some beneficial effect. The former is recommended because of its additional manurial action.

4415. O'CONNOR, B. A.

Insect pests of cocoa.

Agric. J. Dep. Agric. Fiji, 1959, **29**: 92-4, bibl. 2, illus.

Dieldrin spray is recommended for the control of rose beetle, *Adoretus versutus*, on young plants, and dieldrin or DDT effectively controls the larvae of *Prodenia litura* and *Plusia chalcites*. BHC can be used against boring beetles which are occasionally found. Proper sanitation prevents insect damage to stored beans.

4416. STAPLEY, J. H., AND HAMMOND, P. S.

Large-scale trials with insecticides against capsids on cacao in Ghana.

Emp. J. exp. Agric., 1959, **27**: 343-53, bibl. 3, illus.

Large scale trials in 1954-56 showed that gamma-BHC emulsion gave excellent control of capsids, mainly *Sahlbergella singularis*. BHC spray was better than DDT; results with BHC dusts were promising but inconclusive. It is recommended that 4 oz. of gamma-BHC miscible liquid per acre should be applied twice at an interval of 4 weeks. Reinfestation was slow, and retreatment of localized areas of reinfestation should be carried out only when damage is observed. Twofold or threefold increases in yield were obtained following treatment.—Plant Protection Ltd., and Dep. Agric., Ghana.

4417. CACHAN, P.

Contrôle faunistique de traitements insecticides par hélicoptère sur caféière et cacaoyère en basse Côte d'Ivoire. (Insect counts for evaluating insecticidal treatments applied from a helicopter on coffee and cacao plantations in the lower Ivory Coast.)

Phytiat.-Phytopharm., 1959, **8**: 117-30.

Lindane was applied from the air and the insects affected were collected on sheets placed below the trees. Later, further insecticide was applied thoroughly from the ground, and this revealed the proportion of insects that had survived aerial application. Details of the harmful insects and their predators are given. It was concluded that aerial treatment destroyed only a small proportion of the harmful insects and that the low kill of capsids on cacao did not justify the use of aerial spraying. Aerial spraying had less effect on the biological equilibrium in cacao than in coffee.

4418. SILLS, V. E.

The preparation of cocoa.

Agric. J. Dep. Agric. Fiji, 1959, **29**: 76-90, bibl. 5, illus.

Harvesting, fermenting and drying, including details of equipment and buildings.

4419. BRIDGLAND, L. A.

Cacao processing—history and principles.

Processing methods for cacao growers in Papua and New Guinea.

Papua New Guinea agric. J., 1959, **12**: 49-85, bibl. 33, illus., and 87-115, bibl. 1, illus.

In the first paper the factors affecting the chemical changes which lead to the development of the chocolate flavour in the bean during fermentation are reviewed, including field factors affecting fermentation, and the curing and drying processes. In the second paper methods of fermentation and curing in the field, under local conditions, are summarized. Improved methods have been devised which are described and illustrated in detail. The method recommended for general use introduces a short resting phase after the beans have been placed in a draining box on arrival at the fermentary. Fermentation is continued in a shallow box, and the beans are later transferred to standard fermenting boxes. Drying is carried out slowly, starting on a platform-type drier for 24 hours, and then being suspended for 48 hours before completion in a rotary drier for a further 24 hours. The design and operation of a fermentary is described in detail. [See also H.A., 28: 3055.]

4420. FERRÃO, J. E. M.

Influência do processo de secagem no teor de aminoácidos essenciais de cacaos de S. Tomé. (The effect of the drying process on the essential amino-acid content of S. Tomé cacaos.)

Agron. angol. 1957-59, 1959, **11**: 29-37, bibl. 8.

Fermented cocoa beans were dried (1) by 4½ days' exposure to sunlight, the average noon temperature in the shade being 29°C., (2) by leaving them in a flag-stone drier for 24 hours at an average temperature of 73°C., or (3) by 6 hours' treatment with infra-red rays at 52°C. The 3rd method gave the highest values for histidine, isoleucine, leucine, threonine, tryptophane and valine, and the 2nd for phenylalanine and lysine. Sun drying gave the lowest values, that for tryptophane being only ¼ of the value found after infra-red drying. Arginine and methionine were not found in the samples examined. The above results are subject to confirmation.

4421. GRIFFITHS, L. A.

A comparative study of the seed polyphenols of the genus *Theobroma*.

Biochem. J., 1960, **74**: 362-5, bibl. 15.

Although the major polyphenols in the beans of *Theobroma cacao* were also found in a wide range of related species, they are sufficiently characteristic for species identification by paper chromatography. [See also *H.A.*, 29: 866.]—I.C.T.A., Trinidad.

4422. FORSYTH, W. G. C., AND ROBERTS, J. B.
Cacao polyphenolic substances. 5. The structure of cacao "leucocyanidin 1".
Biochem. J., 1960, **74**: 374-8, bibl. 11.

Two C_{15} flavan units with acetal-type linkages. [For part 4, see *H.A.*, 27: 1882.]

Coconuts.

(See also 4380, 4621.)

4423. CEYLON.
Annual Report of the Coconut Research Institute for 1958, being *Sess. Pap.* **21**, 1959, pp. 87, Rs. 2. 20.

Soil chemistry: The NPK experiment in its 23rd year showed continued responses to K, but in other trials responses to P were obtained; nut water analyses for P and K are reported. *Technical chemistry*: Data from studies of nut size variability and weight relationships are presented at length and details are given of an empirical standard coconut. Pot culture experiments are in progress. *Botany*: F_1 trees of both *typica* $\times$ King coconut and the latter $\times$ *nana* are commercially unsuitable; *typica* $\times$ *nana* appears more hopeful. Studies also include the identification of prepotent palms, vegetative propagation and genetic correlation studies. *Crop protection*: Bionomics and control of rhinoceros beetle and *Rhynchophorus ferrugineus*; control methods for the former include bait and light traps and leaf axil placement of repellents; insecticide injections are described for *Rhynchophorus* control. Control of the weed *Euphorbia geniculata* is being studied. *Agrostology*: The studies include pasture management and manuring under coconuts.

4424. CHARLES, A. E.
Nursery selection of coconut seedlings.
Papua New Guinea agric. J., 1959, **12**: 116-18, bibl. 1, illus.

Criteria used in selecting seedlings are early sprouting, vigour and resistance to pests and diseases. Experimental results showed that higher yields in the early years of bearing were obtained from seedlings grown from early sprouting nuts. Vigour was judged at the 4-leaf stage from the girth at the base of the shoot, size, spread and colour of leaves, rapidity of growth and sturdiness of the seedling.

4425. RAPHAEL, P. V., AND EDACHAL, M.
Irrigation of coconut gardens.
Coconut Bull., 1959, **13**: 319-20.

Experiments on the use of sea-water for irrigation, as practised in some areas of Kerala, showed no deleterious effect on the palms and yields were higher than those of the unwatered controls.

4426. ALMEYDA, N.
Effect of fertilizer treatments on coconut yields in Puerto Rico. [Spanish summary $\frac{1}{3}$ p.]
Turrialba, 1959, **9**: 40-2, bibl. 9.

In a 4-year experiment involving the application of 2 lb. each of ammonium sulphate, superphosphate and potassium sulphate, singly and in all combinations, twice annually round the base of each palm, the effects on yields were assessed from the end of the first year. The influence of K was greater than that of N. P was slightly beneficial when applied alone or in combination with K, but it appeared to reduce the effect of N. The increase from N + K (43.7%) was greatest, followed by N+P+K (26.9%), whereas N + P gave only a 3.2% increase.

4427. ANON.
Stem bleeding in coconuts.
Leafl. Coconut Res. Inst. Ceylon. **33**, [1959], pp. 8, illus.

Although stem bleeding may be due to mechanical injury or physiological causes, the main cause is *Ceratosomella paradoxa*. The infected tissues should be completely excised and the wound treated with coal tar or bordeaux paste.

4428. MEDINA DUNO, J.
Como evitar la propagación del anillo rojo del coco. (How to prevent the spread of red ring disease of coconut palms.)
Agric. venezol., 1959, **23**(214): 21.

Control of the nematodes and their ant, weevil and beetle vectors.

4429. ANON.
Coconut caterpillar.
Leafl. Coconut Res. Inst. Ceylon. **34**, 1959, pp. 5, illus.

Nephantis serinopa and its control.

4430. GRESSITT, J. L.
The coconut leaf-mining beetle, *Promecotheca papuana*.
Papua New Guinea agric. J., 1959, **12**: 119-48, bibl. 41, illus.

The pest is described, together with a number of predators and parasites. Fostering lizards, birds, *Oecophylla smaragdina* and other ants aids control. Fronds bearing eggs should be removed but not burned, as this would also kill predators. Fronds bearing adults may be burned or put in screened containers which would allow escape of the predators but not the beetles.

4431. HYDE-WYATT, B. H.

The economics of spraying coconuts from the ground in Zanzibar.

MCKINLAY, K. S.

Note on the possibility of increasing coconut yields by controlling *Pseudotheraptus*.

Misc. Rep. colon. Pestic. Res. Unit 257, Arusha, Tanganyika, [1959], pp. 10, bibl. 1.

Based on the records of a tractor-drawn mist blower used in the control of *Pseudotheraptus wayi* figures are presented for capital and running costs. For a block of 780 acres spraying cost £5 16s. 0d. per acre of which a little over 80% was the cost of the insecticide. At the present price of coconuts it would be necessary to achieve a yield increase of at least 45% for the spraying costs to be covered. In trials in Tanganyika and Zanzibar, however, control of *P. wayi* by spraying has resulted in yield increases of only 40% and 20%, respectively, in the first year. Moreover these increases were not maintained, and in the second year the treated plots are yielding less than the controls. It is considered that more consistent yield increases could be achieved by a higher standard of cultivation. [see also *H.A.*, 30: 3040].

4432. REYES, E. P., AND OTHERS.

Coconut charcoal briquettes.

Philipp. J. Sci., 1958, 87: 33-6, bibl. 2.

Factors affecting crushing strength of shell charcoal briquettes bound with corn starch.

Coffee—general.

(See also 3671, 4377, 4378, 4617.)

4433. INDIAN COFFEE BOARD.

Eleventh Annual Report of the Research Department of the Coffee Board, 1957-1958, Balehonnur, 1959, pp. 184, being *Bull.* 11, Re. 1.

Agronomy: Over the 3 years of a cultivation experiment trenching has proved superior to renovation pitting or deep digging, and light digging in August or November has resulted in higher yields than digging at other seasons. Compost manuring the seed beds ensured maximum germination, which was affected neither by the material used for mulching nor the frequency of watering. The K salt of gibberellic acid inhibited the germination of arabica seeds, whereas treatment of single-noded sucker cuttings with 10 p.p.m. GA for 3 minutes promoted maximum rooting. A foliar application of GA at 50-100 p.p.m. to seedlings resulted in a 3-4-fold increase in height, but soil applications were ineffective. **Botany:** Of 63 crosses between arabica cultivars, 18 showed resistance to leaf disease. Treatment of single-noded leafy sucker cuttings with Seradix L.15 resulted in 71.1% rooting compared with 61% for Seradix L.30 and 62% for cow's urine extract. Wedge grafting arabica scions on robusta stocks

was 80% successful. During the 8 years in which multiple stem bushes of both arabica and robusta have been compared with single stem bushes no appreciable differences in yield have been recorded. **Chemistry:** In the permanent manurial trial further evidence was forthcoming that P was necessary for the efficient utilization of added N. At levels up to 60 lb. N per acre, 30 lb. P and 40 lb. K were found adequate, but at higher N levels these dosages needed increasing. The quality and availability of plant nutrients was generally higher when *Ficus glomerata* was used for shade than when *Albizia stipulata* or dadaps were used. **Entomology:** Dieldrin and BHC were the most satisfactory and consistent insecticides for use against stem borers. Metasystox, Folidol and Gusathion gave 100% control of green bug. The incidence of shot hole borer was least on the BHC sprayed plots. Among nematocides only V.C.13 Nematicide significantly reduced the number of nematodes. **Mycology:** Bordeaux at ½% proved to be as good as, if not better than, any other formulation for the control of leaf diseases, and the addition of detergents, stickers or spreaders did not give any consistent improvement. The initial sterilization of the soil with bordeaux or formaldehyde, followed by routine drenching, gave good control of damping-off and collar-rot. Fair control of brown eye-spot disease was obtained with either 1% bordeaux, 0.4% Flit 406, or 0.4% Dithane.

4434. ANON.

Bramón—Estado Táchira. La Estación Experimental de Café. (The Coffee Experimental Station at Bramón, Táchira State [Venezuela].)

Agric. venezol., 1959, 23(214): 30-4.

From various investigations carried out at this station since its recent establishment, the following conclusions have emerged: Up to the present coffee yields have been higher with a spacing of 3 plants per hole and 2m. between holes, than with 1, 2 or 4 plants per hole and 1, 2 or 3 m. between holes, the rows of holes being 3 m. apart in each case. The descending order of yields under different soil-management practices was: mulching with chopped banana leaves and shoots; manuring with Indore compost; clean cultivation; and cover cropping with *Oplismenus burmanni*, *Zebrina pendula* or indigo. Attempts to rejuvenate old plantations by thinning, opening lanes 2 m. wide, arching the stems, or various combinations of these operations have not yet given conclusive results, but there is evidence that arching has increased production. In artificially shaded nurseries the survival of seedlings was good, but in unshaded beds approximately half were lost; the survivors, however, were better developed than those under shade. In both cases there was a significant response to an application of compost, followed by P and a coffee

parchment mulch 12 cm. deep. Seeds germinated as quickly in the open as in nurseries, but the resulting seedlings developed much more slowly. Transplanting with a ball of soil round the roots was highly successful (97%) when the leaves were left intact, and slightly less so when they were clipped. Other treatments, in descending order of effectiveness were: dipping the roots in mud and clipping the leaves; bare roots and intact leaves; bare roots and clipped leaves; and mud-dipped roots and intact leaves (65%). Experiments on double hedge planting, manuring, the effects of climate on growth, the water requirements of caturra coffee and the use of caustic soda and organic activators in fermentation, and comparisons between commercial varieties are in progress. In the second harvest caturra produced 3.8, semperflorens 3.2, bourbon 2.5, an El Salvador hybrid 1.9 and typica 1.5 kg. per plant. The most effective dust for mealybug control was a mixture of diazinon and aldrin. Liquid application of this mixture was more effective, but also more costly.

Coffee—propagation, establishment and culture.

(See also 4379, 4380, 4433, 4434.)

4435. GUTIÉRREZ Z., G.

Propagación por semillas y establecimiento de un cafetal. (**Propagation from seed and establishment of a coffee plantation.**)

Suelo Tico, 1959, 11(44): 3-24, bibl. 7.

Current practices in Costa Rica described.

4436. PARASURAM, E. P.

On coffee grafting.

Indian Coffee, 1959, 23: 448-51.

Arabica wedge-grafted on to robusta suckers.

4437. KIEHL, E. J.

Novo método para plantação de café. (**A new method of planting coffee.**)

Bol. Super. Serv. Café. S. Paulo, 1959, 34(387): 5-8, illus.

The planning of intersecting roadways with a 3% slope, and the subsequent establishment of contour lines for planting, are described with diagrams for plantations of slight, moderate and steep slope.

4438. LEÓN, J., AND UMAÑA, R.

Rendimiento de café en setos comparado con siembra a distancia corriente. (**Yields of coffee grown as unshaded hedges compared with those from the customary spacing.**)

[English summary $\frac{1}{2}$ p.]

Turrialba, 1959, 9: 43-50, bibl. 15.

Coffee trees were planted in hedge rows at 0.83 m. and 1.66 m. between plants, compared with the usual spacing of 2.5 m.; the distance between rows was the usual 2.5 m. The coffee blocks were bordered by double rows of hevea rubber in order to observe the effect of interplanting. The experiment was established in 1950, and in 1952 half of

the replications were pruned according to the Colombian system, and the other half were left unpruned. After 7 crops no differences in yield attributable to spacing had been found in the pruned plots. In the unpruned plots the total production in 4 years did not show any significant increase from the hedges over the usual spacing. Studies showed that root density varied according to spacing, and that these differences were highly significant. Trunk diameter did not show such a clear trend; however, trunks were slightly larger in the usual spacing than in the close hedges. Picking efficiency was not significantly different in hedges from that in the usual planting system. Yields in these experimental plots without shade were considerably higher than the average yield of shaded coffee trees in the area. [From authors' summary.] Pruned and unpruned blocks did not differ significantly in total yield. The hevea trees, 3.75 m. distant from the coffee blocks, had no significant shade effect, and no root competition was noted during the 7 years of the experiment.

4439. GÓMEZ DUQUE, J.

Café sin sombra. (**Unshaded coffee.**)

Agric. trop. Bogotá, 1959, 15: 853-4, illus.

The results of 10 years' experimentation with unshaded coffee in Colombia have been very good. Bourbon and caturra varieties are planted in double contoured rows alternating with strips of indigofera, kudzu or grasses. Shading used in the nurseries is gradually reduced to expose the coffee completely a few months before transplanting. During these last months in the nursery fertilizers are applied liberally, but in the first 2 winters in the plantation only small amounts of 1 : 1 : 1 fertilizer are used, followed by somewhat higher rates of 2 : 1 : 5 in subsequent winters, when the trees have reached the flowering age. Such plantations can yield 2,500 kg. of parchment per ha. annually compared with 500 kg. from a good plantation of the traditional type.

4440. COEN P., E.

La sombra del café y las temperaturas del suelo. (**Coffee shading and soil temperatures.**)

Suelo Tico, 1959, 11(44): 53-4.

In Costa Rica the pruning of shade trees in March improves the growth of coffee. Soil temperature maxima occur in March and April from 0-50 cm. depth, and in June and July from 50 cm.-1 m. Sufficient shade should be left to check heat loss by radiation at night. Planting rows N-S allows the greatest absorption of heat by the soil during the day, especially in the absence of weeds.

4441. BARROS, M. DE S., JR.

Solos e cafés finos. (**Soils and high quality coffees.**)

Bol. Super. Serv. Café, S. Paulo, 1959, 34 (384): 5-7.

When an old coffee area was replanted, the introduction of *Inga* sp. for shade and frost protection corrected soil acidity, increased yields and improved the quality of the coffee. Trenches 40–50 cm. deep between the crop and the shade trees successfully prevented competition for soil nutrients. Bourbon types, both red and yellow, responded best to shade, but caturra types required more light and warmth.

4442. ANON.

Combate à geadas nos cafés. (**Frost protection in coffee plantations.**)

Diário de S. Paulo, 6 Feb., 1959, reprinted in *Bol. Super. Serv. Café, S. Paulo*, 1959, 34 (385): 26-7.

Brief information is given on fog generators for protecting 10,000, 50,000 or 100,000 coffee bushes. They should be put into operation when the temperature falls to 3°C.

4443. ROBINSON, J. B. D., AND WALLIS, J. A. N.

Recommendations for the application of organic mulches in coffee.

Kenya Coffee, 1960, 25: 14-15.

The usual mulch grass, *Pennisetum purpureum*, increases the K content of the soil and adversely affects the uptake of Mg by the coffee. Sisal waste has a much lower K content. Work is also in progress on alternative grasses such as *Panicum maximum*, *Cymbopogon validus* and *Hyparrhenia* spp. Details are given of mulching young and mature coffee in the various regions. Ammonium forms of N fertilization should be used with mulch, cattle manure being an alternative, not a supplement.

4444. ROBINSON, J. B. D., AND WALLIS, J. A. N.

Recommendations for the application of cattle manure to coffee.

Kenya Coffee, 1959, 24: 488-9.

For new plantings an application of 6–8 gal. of cattle manure plus 2 oz. of double superphosphate per planting hole is advised. In mature coffee the use of cattle manure is only recommended on eroded slopes and on light infertile soils. When cattle manure is applied, the usual dosage of artificial N may be halved.

4445. FRANKART, R., AND CROEGAERT, J.

Contribution à l'étude de la nutrition minérale du caféier robuste en Uele. (**A contribution to the study of the mineral nutrition of robusta coffee in Uele [Belgian Congo].**)

Publ. Sér. sci. I.N.É.A.C. 80, 1959, pp. 107, bibl. 18, 100 B.fr.

Following an account of the climate, vegetation, soils and geology of the Uele district, details are given of the cultural methods employed, the effects produced by ecological conditions on the mineral composition of the leaves, the reference levels of the

nutrients and the symptoms associated with mineral deficiencies. It is concluded that the nature of the soil directly affects the chemical composition of the leaf and is largely responsible for yield, whereas the influence of cultural methods is indirect, depending mainly on their effect on the soil. The optimum concentrations of nutrients in the leaf were found to be in the region of 2.7% N, 0.10% P, 1.6% Ca, 0.35 Mg, 2.0% K, total cations 160 m.eq./100 g., giving a Ca/Mg/K ratio of 50/18/32. The commonest cause of N deficiency proved to be unsuitable cultural practices affecting the water table, whereas most other deficiencies were due to the soil itself.

4446. ABRUÑA, F., VICENTE-CHANDLER, J., AND SILVA, S.

The effect of different fertility levels on yields of intensively managed coffee in Puerto Rico. *J. Agric. Univ. P.R.*, 1959, 43: 141-6, bibl. 3, illus.

Three levels each of N, P and K were tested on coffee planted at 2,000 trees/acre. Marked yield increases were obtained from 150 lb./acre of N in each of the 3 years of the experiment, and a response was shown to an additional 150 lb. in 2 years of normal rainfall. There were also responses to both 150 lb. and 300 lb./acre of K in certain years. There was no significant response to P.

4447. DE MELLO, A. T.

Conhecimento morfológico imprescindível na poda do cafeeiro: (**Morphological knowledge indispensable for coffee pruning.**) *Bol. Super. Serv. Café, S. Paulo*, 1959, 34(383): 5-7, bibl. 7, illus.

A general account of shaping and pruning for production.

4448. PATTABHIRAMAN, T. V., AND ANANTH, K. C. **Running blossoms in arabica coffee on the Nilgiris.**

Indian Coffee, 1959, 23: 497-502, bibl. 3.

Methods found effective in minimizing continuous and irregular flushing under the climatic conditions of the Nilgiri hills were: spraying with 2 : 2 : 40 bordeaux, whenever 3 pairs of unsprayed leaves were observable, to encourage retention of the older leaves; increasing the N : P and N : K ratios in the fertilizer applied in July; and lopping the shade trees only after mid-August, merely branch thinning at other periods.

4449. PAGACZ, E. A.

Quelques considérations sur la floraison du caféier. (**Some considerations on coffee flowering.**) [Flemish summary 1 p.] *Bull. agric. Congo belge*, 1959, 50: 1531-40, bibl. 4, illus.

Floral development was incomplete in arabica and robusta coffee growing in a greenhouse at 23–25°C.

and 60–80% RH. Treatment with IBA or IAA was unsuccessful, but GA gave good results when painted on flowers that were showing arrested development. When GA was applied 1, 2 and 3 times at 25, 50 and 100 p.p.m. to arabica, the best results (91% flowering) were obtained with 100 p.p.m. applied 3 times. In another trial 3 applications of 100 and 200 p.p.m. gave 84–85% flowering in arabica and 91% in robusta. In a third trial on arabica 3 and 4 applications of 100 p.p.m. gave 89–90% flowering. The flowers opened 9 and 10–11 days after treatment in robusta and arabica, respectively.—Lab. Phytotech. trop., Univ. Louvain.

Coffee—diseases and pests.

(See also 3197, 4417, 4433, 4434.)

4450. STEHLÉ, H., AND BLANCHE, D.

Les affections des caféiers aux Antilles françaises et les remèdes à leur appliquer. (Maladies of coffee trees in the French West Indies and their control.)

Café, Cacao, Thé, 1959, 3: 134-46, bibl. 10.

Diseases and pests and the symptoms they produce are listed and described with notes on control measures. Sections also deal with phytosanitary regulations and modern chemical methods of plant protection.

4451. BIANCHINI P., C.

Síntomas, prevención y combate de las principales enfermedades del café en Costa Rica. (Symptoms, prevention and control of the main coffee diseases in Costa Rica.)

Suelo Tico, 1959, 11(44): 37-48, bibl. 15.

4452. GEORGE, K. V.

Stem-wasting disease of coffee.

FAO Plant Prot. Bull., 1959, 8: 22.

This malady occurs most commonly from August to October on 8–11-month-old arabica seedlings of several varieties. Inoculations with associated fungi have not reproduced the disease. It appears to be invariably associated with frequent and high doses of bordeaux mixture.—Res. Dep., Coffee Bd, Balehonnur, S. India.

4453. REYES, T. T.

Ring spot disease of coffee.

FAO Plant Prot. Bull., 1959, 8: 11-12, bibl. 2, illus.

Occurring in the Philippines; probably a virus.

4454. ECHANDI, E.

La chasparria de los cafetos causada por el hongo *Cercospora coffeicola* Berk. & Cooke. (Leaf spot of coffee caused by the fungus *Cercospora coffeicola*.) [English summary ½ p.]

Turrialba, 1959, 9: 54-67, bibl. 21, illus.

The fruits, as well as the leaves, of coffee are damaged by the pathogen, which can also infect

castor beans (*Ricinus communis*) and *Leonurus sibiricus*. Surface moisture and exposure to sunlight were shown experimentally to increase the spread of the disease, and where soil moisture was deficient the susceptibility of the plants was increased. With the customary wide spacing of 2.5 × 2.5 m., in both sun and shade, the incidence of the disease was higher than with various closer spacings. The plants least affected were those in shaded double hedges 2.5 m. apart, with 0.836 m. between the plants.

4455. BOCK, K. R.

Notes on the control of coffee berry disease.

Kenya Coffee, 1960, 25: 16-17.

For the control of *Colletotrichum coffeanum* high volume 50% copper formulations or bordeaux sprays are recommended. These also effectively control rust, *Hemileia vastatrix*. Rates and times of application suitable for the various Kenya areas are given.

4456. D'OLIVEIRA, B., AND RODRIGUES, C. J., JR.

Progress report to Ethiopia. Physiologic races in Ethiopia of *Hemileia vastatrix* and resistance in certain selections of *Coffea arabica* to this rust. [In English.]

García de Orta, 1959, 7: 279-92, bibl. 12.

Data are tabulated on the degree of resistance of *Coffea racemosa* and lines of *C. arabica* and *C. congensis* to various strains of *Hemileia vastatrix*. The majority of the tests were carried out on bourbon types of *C. arabica*.

4457. SEIXAS, C. A.

O novo surto de broca do café em face da eventual resistência biológica ao inseticida BHC. Considerações sobre o custo do combate à praga. (The recent increase in coffee borer populations and possible biological resistance to the insecticide BHC. Considerations on the cost of controlling the pest.)

Bol. Super. Serv. Café, S. Paulo, 1959, 34 (385): 9-15.

Abnormally high rainfall during 2 successive years in S. Paulo and Paraná markedly increased the infestation of coffee by berry borers. The widespread idea that the pest had developed resistance to BHC was refuted by experiment. At the current price received for coffee, control of borers was uneconomic in plantations producing less than 40 arrobas (1,280 lb.) per 1,000 plants.

4458. BOURIQUET, G., AND OTHERS.

Un chancre de l'écorce de l'*Albizia stipulata* à Madagascar. (A black canker of *Albizia stipulata* in Madagascar.) [English and Spanish summaries ½ p. each.]

Agron. trop., 1959, 14: 711-20, bibl. 8, illus.

Attacks of *Phytophthora drechsleri*, which occurs as a wound invader on this shade tree of coffee, can

be prevented by painting the area with a soapy emulsion of 5–20% carbolineum. Curative treatment is by removing the diseased and surrounding tissues and disinfecting the wound with a concentrated copper compound. After healing the area should be painted with the soap solution.

Coffee—processing and composition.

4459. MONACO, L. C.

Fermentação do café despulpado. (**The fermentation of depulped coffee.**)

Estado de S. Paulo, Supl. agric., 13 May, 1959, reprinted in *Bol. Super. Serv. Café, S. Paulo*, 1959, **34**(388): 21-2.

The proprietary preparation known as Benefax, used at 1 kg. per 400 kg. of coffee after pulp removal, reduces the period of fermentation to about 2 hours. If natural fermentation is practised, an inoculum should be collected by adding a small quantity of water. This is added to subsequent lots of fermenting coffee, and reduces the duration of the process by 15–20 hours in cold weather. In Guatemala a 2% solution of potassium carbonate is used for mucilage removal.

4460. TOSELLO, A.

Normas práticas para o preparo do café. (**Practical rules for processing coffee.**)

Bol. Super. Serv. Café, S. Paulo, 1959, **34**(387): 11-15.

The wet and dry methods used in Brazil described. [See also *H.A.*, 28: 961c.]

4461. RHOADES, J. W.

Analysis of the volatile constituents of coffee.
J. agric. Food. Chem., 1960, **8**: 136-41, bibl. 6.

Large variations in the concentrations of 16 volatiles were found in the 4 types of green coffee examined, particularly those of dimethyl sulphide, isobutyraldehyde, acetone, methylethylketone, isovaleraldehyde and ethanol. These differences might be of value for grading.—*S.W. Res. Inst.*, San Antonio, Tex.

Mangoes.

4462.* LEDIN, R. B., AND MALCOLM, J. L.

Mango selection, propagation and culture.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 363-5.

The Cecil variety has shown a definite pattern of alternate bearing, with 12 other varieties following the same trend. Twenty one varieties were found to be irregular rather than alternate bearers. James and Rockdale Saigon were most consistent in bearing, yet they also showed slight decreases in some alternate years. Nitrogen in the fertilizer improved growth and increased cold resistance, but increasing the rates from 50 to 200 lb. of N per acre had no significant effect on growth. [This report also confirms earlier findings reported in *H.A.*, 29: 897.]

4463. POPENOE, W.

El mango. (**The mango.**)

Ceiba, reprinted in *Suelo Tico*, 1959, **11**(43): 23-7.

The variation in Indian types of mango is attributed to monoembryony and the relative uniformity of Manila types to polyembryony. The varieties Mulgoba, Haden, Amini, Pairi (Bombay), Julie and Saigon are described, and cultural practices are briefly discussed, the emphasis being on grafting. Resistance to *Anastrepha* spp. is high in Julie and low in Saigon.

4464. TREE, E. F.

The Kensington mango.

Qd agric. J., 1959, **85**: 749-51, illus.

Of uncertain origin, this variety breeds true from seed, is free from fibre and has a very rich flavour.

4465. JAIN, N. L., KRISHNAMURTHY, G. V., AND LAL, G.

Non-volatile organic acids in fresh unripe pickling mangoes and salted mango slices by paper chromatography.

Food Sci. Mysore, 1959, **8**: 115-17, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: i-87.

Oxalic, citric, malic, succinic and ascorbic acids plus 2 unknown acids were found in fresh mangoes.

Oil palms.

(See also 4378-4380, 4624.)

4466. W.A.I.F.O.R.

Seventh Annual Report of the West African Institute for Oil Palm Research 1958-59, 1959, pp. 140, 2s. 6d.

Agronomy: A small but significant response to P was obtained in Owerri Province and a larger one in Ghana. The replacement of shade by overhead irrigation and mulch in the pre-nursery resulted in striking responses to N fertilizers, their residual effects being apparent a year later in the nursery. The value of initial deep ploughing and mulching throughout the year in the nursery was confirmed; also the previous response to Mg. *Plant nutrition*: Work continued on the delineation of macro- and micro-nutrient deficiency symptoms at various stages of growth. *Plant pathology*: Orthocide 50W, ziram, and Phaltan 50W all proved more efficient in controlling freckle and cercospora leaf spot in the nursery than Perenox. The date of planting was found to have a great effect on the incidence of blast disease, this ranging from almost 20% for late August plantings to nil for those in early November. Soil fumigation with Santobrite also reduced the incidence of blast.

4467. BREDAS, J., AND SCUVIE, L.

Aperçu des influences climatiques sur les cycles de production du palmier à huile. (**A review of the effects of climate on cycles of production in oil palms.**)

Oléagineux, 1960, **15**: 211-22, bibl. 23.

Under the climatic conditions at Yangambi, Belgian Congo, the inflorescence in the axil of each leaf began to form 30-36 months before flowering, and the female inflorescences took 3-3½ years to develop from their differentiation up to fruit maturity. The proportion of abortive inflorescences was very variable in young palms but fairly stable at an average of 10% in those 8 or more years old. There was strong evidence that abortion was enhanced by drought occurring at a critical phase, 4-9 months before anthesis, i.e. 20½-23 months before harvest. On the other hand, an earlier drought 3½ years before harvest had a favourable effect on production by increasing the proportion of female to male inflorescences. An equation is given relating the rainfall deficit to the number of bunches of nuts produced.

4468. POELS, G.
La qualité des fruits de palme produits par les agriculteurs congolais. (**Quality of the oil palm fruits produced by Congolese farmers.**) *Bull. Inf. I.N.É.A.C.*, 1959, 8: 309-15, illus.
Oil contents of wild or semi-wild *dura* seedlings much lower than that of hybrid selections.

Papaws.

(See also 4609.)

4469. JIMÉNEZ, H., AND HOROVITZ, S.
Cruzabilidad entre especies de *Carica*. (**Hybridization possibilities between *Carica* species.**) [English summary ¼ p.] *Agron. trop. Maracay*, 1958, 7: 207-15, bibl. 1, illus.
Carica monoica, *C. cauliflora*, *C. microcarpa* and *C. candamarcensis* have all proved interfertile. When any one of these species is crossed with *C. papaya* however, only immature seeds are produced, but in most cases the embryos from these can be cultured. The species *papaya* and *goudotiana* are intersterile. [For interspecific grafts see *H.A.*, 30: 2935.]

4470. DE ZERPA, D. M.
Triploides de *Carica papaya*. (**Triploids of *Carica papaya*.**) [English summary ¼ p.] *Agron. trop. Maracay*, 1957, 7: 83-6, illus., [received 1960.]

Two triploid ($3n = 27$) plants of papaw obtained by embryo culture of seeds from a tetraploid $\times$ diploid cross.

4471. BHATIA, B. S., KRISHNAMURTHI, G. V., AND LAL, G.
Preparation of pectin from raw papaya (*Carica papaya*) by aluminium chloride precipitation.
Food Sci., Mysore, 1959, 8: 314, from abstr. in *J. Sci. Food Agric.*, 1960, 11: i-146.

Pineapples.

(See also 4609.)

4472. ARROYO, C.
El cultivo de la piña. (**Pineapple growing.**) *Suelo Tico*, 1959, 11(43): 3-8.

Cultivation of pineapples in Costa Rica described and compared with that in Hawaii.

4473. WANG, H., AND CHANG, S. M.
A comparative test of the four types of Smooth Cayenne pineapple. [Chinese, with English summary 2½ pp.] *Publ. Taiwan agric. Res. Inst.*, 1959, pp. 14, bibl. 14, illus.

Vegetative, flower and fruit characters of 4 strains of Smooth Cayenne [see *H.A.*, 29: 4067] are described in detail and illustrated. The normal Smooth Cayenne variety has desirable vegetative characteristics and gives a high yield of large, good quality fruit suitable for canning. The "Collar of Slips" type gives a low yield of poor quality fruit and should be discarded. The "Sarawak" type yields well but the fruit is of poor shape and low specific gravity. The "Elevated Eye" fruits have a high specific gravity but are small, and the yield is low.

4474. MARTIN-PRÉVEL, P.
Carence en potassium sur ananas en Guinée. (**Potassium deficiency of pineapples in French Guinea.**) *Fruits d'Outre Mer*, 1959, 14: 414-19, illus.

Summaries ½ p. each in French, English, Spanish, Russian and Portuguese of paper abstracted in *H.A.*, 30: 1310.

4475. YOW, Y. L.
The time of maturity for the summer crop of pineapples in relation to climatic and cultural conditions. [Chinese, with English summary 2 pp.] *J. agric. Ass. China*, 1959, No. 27, pp. 26-46, bibl. 12.

In sufficiently mature pineapple plants flower differentiation was initiated by a period of low temperature in the winter. The length of the period from initiation to flower bud emergence (usually 60-70 days) was negatively correlated with the mean temperature of the 60 days after initiation. There was also a negative correlation between the number of days from flower bud emergence to maturity (usually 140-147 days) and the square root of the mean temperature for 30 days after emergence. Close planting or the addition of N and K fertilizers delayed maturity. High leaf P and straw mulching hastened ripening.—Taiwan Pineapple Corp.

4476. PY, C.

Essais d'emballage pour ananas (campagne 1958-59), (**Experiments in pineapple packing, season 1958-59**). [English summary 8 lines.]

Fruits d'Outre Mer. 1959, 14: 467-70, illus.

A 20% reduction in packing costs was achieved by using a longer case ($63 \times 43 \times 16$ cm.), standard wood-fibre cushions (63×43 cm.) for the top and bottom and locally made straw cushions (53×16 cm.), between the fruits at the ends.—I.F.A.C., Foulaya.

Rubber trees.

(See also 4378, 4379.)

4477. RUBBER RESEARCH INSTITUTE OF MALAYA. *Annual Report of the Rubber Research Institute of Malaya for 1957*, [1959], pp. 95, \$(Malay.) 3.

Soils division: On inland soils there was a marked response to P applied in the planting hole, little effect in the following 2 years, and a resumption of P response in the 3rd and subsequent years. The application of N was effective at all times after planting, whereas that of K gave less consistent results. Young replanted areas on coastal alluvial soils showed no clear evidence of any fertilizer response. The best results with mature rubber in inland areas came from NPK mixtures, but in coastal areas mature rubber responded only to N and perhaps to K. Dowpon proved the most effective weed killer, little or no recovery of lalang, bracken and sedges being observed 12 months after the application of 20 lb. per acre. Aminotriazole at 15 lb. per acre was also highly effective, and wild palms were killed by 8 oz. of Lallicide in 2 pt. water per clump. Studies of soil nutrients indicated that the N content of the top soil increased from 10 to 100 p.p.m. after clearing and planting, and that ammonium N was at a higher level than nitrate N at all depths down to 3 ft. under the three cover crops tested, viz. *Pueraria*, *Mikania* and grasses.

Botanical division: In the second year of tapping of clones RRIM 600 to 618, 613 was the highest yielder, and in the first year of tapping of clones 619 to 630, 623 was the most promising. In tapping experiments on clone Gl 1 third daily tapping of a half spiral cut was the most economical system. High yields were recorded from 28-year-old budded trees after $2\frac{1}{2}$ years of 200% tapping, although signs of interaction between cuts became apparent. The growth substances 2,4,5-T and 2,4-dichloro-5-fluorophenoxyacetic acid had the greatest effect on yield and bark renewal, 2,4-D had rather less effect, and 2,4,6-T, diphenyl urea and freeze-dried coconut milk concentrate were inactive. Cutting the seed coats of leguminous cover crops before sowing was a far more effective

way of improving germination than soaking the seeds in GA concentrations of 1, 10 and 100 p.p.m. *Pathological division*: The effectiveness of normal butyl 2,4,5-T as a stump poison was increased by the addition of boric acid. The incidence of pink disease was not affected by K or P fertilization but increased with rising levels of N nutrition. Watering the soil with an aqueous solution of Gammexane produced a greater kill of cockchafer grubs than a similar solution of aldrin. DDT was effective in controlling ladybird beetles in cover crops, but endrin was better against caterpillars. Nematodes infesting legume cover crops were found capable of penetrating the roots of rubber trees.

4478. DE SILVA, C. A., AND CHANDRASEKERA, L. B. **A method of inducing floral stimulus for early flowering of *Hevea brasiliensis***. *Quart. J. Rubb. Res. Inst. Ceylon*, 1959, 35: 50-5, bibl. 2, illus.

By ring barking 6 in. above the graft union and bending the budshoot and secondary shoots into a horizontal position, young rubber trees were induced to flower 2 years after planting. Fruit set was poor in FX 25 but very heavy in RRIC 52.

4479. BURKILL, H. M.

Large scale variety trials of *Hevea brasiliensis* Muell-Arg. on Malayan estates 1934-53.

J. Rubb. Res. Inst. Malaya, 1959, 16: 1-37, bibl. 9.

The conclusion that seedlings are more vigorous than clones was substantiated in these trials, but there was some indication of better bark renewal by clones than by seedlings. High susceptibility to brown bast was inherent in all the seedling families tested, whereas the level of susceptibility in clones varied from high to very low. The variety RRIM 501 consistently gave higher yields than all the other varieties both on inland and coastal estates, although RRIM 511, 513 and 520 may also be recommended for inland soils and RRIM 513, Gl 1, RRIM 500, 508 and PB 86 for coastal soils.

4480. ANON.

RRIM 600 series clones.

Plant Bull. R.R.I.M., 1960, No. 46, pp. 8-13.

A fifth interim report covering clones 600-630, comparing girth increments and tapping yields with RRIM 501.

4481. HOELZ, J. J.

Cultura da seringueira. (***Hevea cultivation***.) [Publ.] *Dep. Prod. veg., Secret. Agric., São Paulo*, 1958, pp. 16, illus., from *Trop. Abstr.*, 1960, 15, Abstr. h732.

Including clones recommended for São Paulo where frosts and low rainfall are limiting factors.

4482. LEVANDOWSKY, D. W.
 Multiplication de l'*Hevea brasiliensis* par bouture. (**The propagation of *Hevea brasiliensis* by cuttings.**) [English, Spanish, German and Italian summaries, 15 lines each.]
Rev. gén. Caoutch., 1959, **36**: 1132-41, bibl. 15, illus.
 For an English version see *H.A.*, 30: 2943.
4483. EVERS, E.
 La présélection des semenceaux en hévéa-culture. (**The pre-selection of seedlings in rubber growing.**)
Publ. Sér. tech. I.N.É.A.C. **58**, 1959, pp. 63, bibl. 19, illus., 50 fr. (Belg.)
 Investigations at Yangambi since the previous publication on this subject [*H.A.*, 23: 1310] have confirmed some of the tentative conclusions then reached. Seedlings are considered to be robust planting material, with excellent powers of bark regeneration and little proneness to disease. They should be planted at a high density which allows stringent roguing. The first roguing should be done to expedite tapping and ensure early high productivity. Subsequent removals should only be for the purpose of providing adequate space for those trees capable of giving higher yields.
4484. POERNOMO, —.
 Pengaruh tjara menanam okulasi karet mata tidur. (**The effect of the method of planting rubber stumps with dormant buds.**) [English summary 6 lines.]
Menara Perkebunan, 1960, **29**(1): 3-6, illus.
 Cutting off all side rootlets retarded the development of the young plants, by comparison with plants on which the side rootlets had been cut to 25 cm. The latter developed as well as those with uncut rootlets.
4485. OTOUL, E.
 Influence du sol et du précédent cultural sur la croissance des jeunes hévéas. (**The influence of the soil and previous cultivation on the growth of young hevea.**)
Bull. Inf. I.N.É.A.C., 1959, **8**: 355-74, bibl. 3, illus.
 Young rubber trees were grown on 4 soil types, each of which contained areas of differing history, viz., a previous stand of rubber, regenerated forest and uncut forest. Numerous plant measurements made at intervals up to 22 months are recorded, and data are also tabulated for leaf and soil analyses. In general, rubber grew best on soils containing 30-35% of clay. On lighter soils growth was slower, and this was particularly so where rubber followed rubber or where it followed forest that had been allowed to regenerate for only 12 years.
4486. ANON.
The nitrogen content of leguminous creeping covers.
Plant. Bull. R.R.I.M., 1960, No. 47, pp. 35-9.
 The weights of green material, of leaf and stem litter and of total N and the C/N ratio of the stem litter were determined 12, 18 and 34 months after planting leguminous creepers, grasses and *Mikania scandens* as cover crops under rubber. The 12-month figures were also compared with a natural cover (a mixture of *Trema*, *Ficus*, *Macaranga*, *Hornstedtia* spp. and others). Of the planted crops the leguminous creepers produced the highest yield of green material per acre at all dates, the greatest amount of leaf and stem litter at 12 and 34 months, $2\frac{1}{4}$ to $4\frac{1}{2}$ times as much N as other cover crops according to date, and a relatively low C/N ratio. The natural cover, although far heavier cropping, produced 10% less N and a 56% increase in the C/N ratio compared with the legumes.
4487. VAN DER KNAAP, W. P.
Growth and fertilizing of young hevea in Besuki (III). Situation after six years of field experiment.
Menara Perkebunan, 1959, **28**: 23-37 [Indonesian], 195-207 [English], bibl. 5.
 Further results from experiments previously reported [*H.A.*, 26: 1183] are reviewed. Improved growth resulted from dressings of ammonium sulphate alone, and even better results were obtained with superphosphate in addition. A level of 2.5 kg. of ammonium sulphate per tree for 6 years is considered sub-optimal and further trials are proposed.
4488. VAN DER MAREL, H. W.
Determination of P status of *Hevea brasiliensis* by bark analysis.
Plant and Soil, 1960, **12**: 5-16, bibl. 53.
 Soil levels of available P were found to be better represented by hevea bark analysis than by soil analysis. Bark analysis was less affected by date of sampling than leaf analysis.—Soil Survey Inst., Wageningen.
4489. ANON.
Secondary leaf fall and South American leaf blight.
Plant. Bull. R.R.I.M., 1960, No. 46, pp. 3-7, illus.
 Fungus and insect parasites causing secondary leaf fall in Malaya are described and illustrated in colour. South American leaf blight, which also could cause secondary leaf fall but which has not yet been found in Malaya, is described in detail. Precautions to be taken, if its presence is suspected, are outlined.
4490. WIJEWANTHA, R. T.
Report on the sulphur dusting of smallholdings in 1958/59.
Quart. J. Rubb. Res. Inst. Ceylon, 1959, **35**: 58-69, bibl. 2, illus.

Of the 1884 holdings dusted 1824 were practically free from *Oidium heveae*, and only 20 showed more than 5% defoliation from this cause.

4491. OEI HONG PENG AND SUTAKARIA, J.
Beberapa tjtatan mengenai bulukakar karet pada dewasa ini. (**Some notes on root diseases of rubber today.**) [English summary $\frac{1}{2}$ p.]
Menara Perkebunan, 1959, 28: 239-43, bibl. 13, illus.

Factors causing spread and fungicides for use in control.

4492. ANON.
Tree and stump poisoning.
Plant. Bull. R.R.I.M., 1960, No. 47, pp. 39-44, illus.

Sodium arsenite solution made into a paste with starch, although hazardous, has been successfully used to kill old stumps. 2, 4, 5-T, as a 5% solution in diesoline, is recommended, although it is slower in action; a 2½% solution can be used for thinning young trees.

4493. ANON.
All rubber rainguard.
Plant. Chron., 1950, 55: 12, illus.

A rainguard is described, which effectively protects the tapping panel from all but the heaviest rain. This was developed and tested by the Ceylon Institute of Scientific and Industrial Research.

4494. HEINISCH, K. F.
A note on a simple method of control of latex coagulation.
Quart. J. Rubb. Res. Inst. Ceylon, 1959, 35: 56-7.

By adjusting the pH to 4.4-4.8, using Bromo Cresol Green paper as indicator.

4495. D'AUZAC, J., NGUYEN-HUNG-CHAT AND PUJARNISCLE, S.
Sur quelques facteurs du développement microbien au sein du latex et ses conséquences. (**On some factors of bacterial growth in latex and resulting effects.**) [In French and English with short summaries in German, Spanish and Italian].

Rev. gén. Caoutch., 1960, 37: 61-8, bibl. 13.
Factors which increase latex production were found also to increase its susceptibility to bacterial infection. This susceptibility is shown to be correlated with the phosphorus and carbohydrate contents of the latex and also with the clonal variety used.

4496. TAYSUM, D. H.
A method for counting the total bacteria in ammoniated *Hevea* latex systems.
J. appl. Bact., 1959, 22: 264-71, bibl. 3, illus.
For other aspects of this work, see *H.A.*, 28: 1999n, 1999o and 29: 3000.

4497. D'AUZAC, J., AND PUJARNISCLE, S.
Les glucides de l'*Hevea brasiliensis*. Étude qualitative. (**The carbohydrates of *Hevea brasiliensis*, a qualitative study.**) [English, German, Spanish and Italian summaries 12-14 lines each.]
Rev. gén. Caoutch., 1959, 36: 1687-92, bibl. 11, illus.

Examination of the latex, wood, root and bark showed that, in addition to sugars of low molecular weight such as mono- and di-saccharides, the tissues contained higher polymers, most probably galactanes, arabanes, xylanes, rhamnanes and starch.

Sugar cane—general.

(See also 4377, 4615, 4619.)

4498. QUEENSLAND (KING, N. J., AND OTHERS).
Fifty-ninth Annual Report of the Bureau of Sugar Experiment Stations, 1958-59, Brisbane, 1959, pp. 103, illus.

Division of soils and agronomy: Adequate nutrition was obtained from 4 cwt. of Sugar Bureau Mixture No. 2 plus a top dressing of 4 cwt. of sulphate of ammonia. At Mackay a cowpea-velvet bean green manure crop ploughed in before planting provided all the necessary N. Large yield increases were obtained by the use of soil fumigants to destroy nematodes. Resistance to damage by the long hot-water treatment of setts was found to increase from June to September. *Division of plant breeding*: Q. 67 was approved for use in the Burdekin area, Q. 68 for the central district, and Co. 475 for the Mossman, Mulgrave and Babinda areas. *Division of entomology and pathology*: The broadcasting of BHC and aldrin significantly increased yields from cane infested with *Rhyparida dimidiata*. Laboratory tests showed that heptachlor, aldrin, diazinon and lindane were 100% lethal to funnel ants (*Aphaenogaster pythia*), whereas only lindane and aldrin gave complete kills of the larvae of the soldier fly (*Metoponia rubriceps*). The report also contains short reports from 4 sugar Experiment Stations and information on entomological and disease investigations and on mill technology.

4499. HAWAIIAN SUGAR PLANTERS' ASSOCIATION.
Report of the Hawaiian Sugar Planters' Association Experiment Station, October 1st, 1958 to September 30th, 1959, [1959], pp. 79, illus.

Cultural practices: The critical level for Ca response has been redefined. S levels were found to be higher in the subsoil than the surface soil. Lysimeter studies have shown leaching losses of N to be from 105 to 165 lb./acre and of K from 210 to 310 lb./acre. The P content of internodes 8-10 can be used as an indicator of P requirements. The effect of climate on P metabolism was studied, and good growing conditions were found to increase this,

with consequent P deficiency in the internodes. Gibberellic acid, applied in irrigation water or as a foliar spray, did not increase yields. Experiments were made with labelled nutrients, including C^{14} , P^{32} , K^{42} , Ca^{45} and N^{15} . **Diseases:** Work continued on the development of resistance to Fiji disease, downy mildew, red rot, pineapple disease and leaf scald, and several fungicides were tested against pythium root rot. **Insects:** Endrin biscuits were found to be potentially valuable for the control of rats in overgrown cane fields. **Mechanization.** A seed cane harvester producing machine-cut setts was tested and proved successful, and a two-way cane planter is being designed. Other machines and implements being tested included a field road replant attachment, a high pressure liquid fertilizer injector, cut cane rakes, a cutter transport harvester, a cut-throw experimental harvester, a two-way cut-load harvester and a harvested cane core sampler. **Tillage:** The disc harrow was not found to compact low humus latosols in the summer, but it caused restricted root development when used after prolonged winter rains or on higher humus and hydro-humus latosols. **Varieties:** CMU applied at a very late stage gave the best control of flowering, although a new formulation, DCMU, appeared equally promising. **Weed control:** Several new herbicides were screened and the reactions of different varieties to them studied.

4500. SOUTH AFRICAN SUGAR JOURNAL.

The South African sugar year book, 1958-59. South African Sugar Journal, 321 Smith St., Durban, 1959, $10\frac{1}{2} \times 8\frac{1}{2}$ in., pp. 256, illus., 10s. (post free).

For the scope of this comprehensive reference book, of which this is the 29th edition, see *H.A.*, 29: 1934.

4501. U.S. DEP. AGRIC., FOREIGN AGRICULTURAL SERVICE.

Drought interrupts upward trend in world sugar production.

Foreign Agric. Circ. U.S. Dep. Agric. FS 6-59, 1959, pp. 7.

The 1959-60 total sugar production now estimated at 54.4 m. short tons, 2% below the record. Drought affected the beet-sugar crop.

4502. THIELKE, C.

Der Sprossscheitel in der Gattung Saccharum. (The growing point in the genus Saccharum.)

Naturwissenschaften, 1959, 46: 478-9, bibl. 1, illus.

Sugar cane—breeding and varieties.

(See also 4498, 4534, 4535.)

4503. BARBADOS.

Twenty-fifth Annual Report of the British West Indies Central Sugar Cane Breeding Station for the year ending Sept. 30th, 1958, 1959, pp. 44, illus.

Inbreeding programme: Investigations are proceeding along 3 lines, viz: crosses between related parents, top-crosses using selfs as male parents with proven female varieties, and the development of selfed lines homozygous for certain characters. **Laboratory work:** Male sterility in B. 37161 was shown to be due to the breakdown of maturing pollen grains. Chromosome counts failed to show any reduction in chromosome numbers in second generation selfings of certain very vigorous lines of this variety. Preliminary experiments on the development of a hot-water technique for emasculating cut arrows of B. 3337 and B. 4098 were encouraging.

4504. KANDASAMI, P. A.

Economic characters of triploids of *Saccharum spontaneum* Linn. and their utilization in sugar-cane breeding.

Sci. and Cult., 1960, 25: 491-2, bibl. 2, illus.

Giant triploid plants with brix, sucrose and purity of 20%, 14.57% and 83.7%, respectively.

4505. LOH, C. S., AND TSENG, P. M.

Breeding for high yielding varieties of sugar-cane. [Chinese, with English summary 1 p.] *J. agric. Ass. China*, 1959, No. 27, pp. 19-25, bibl. 2.

Experiments with autumn planted cane showed that harvestable stalks developed from first and second order tillers, which emerged 3-5 months after planting. Most of the weight of the harvestable stalks, however, was formed during the summer following planting. The tillering ability of new seedlings was retained by plants propagated vegetatively from them.—Taiwan Sugar Corp.

4506. ORTEGA, D. A., AND TORRELLAS G., A.

Cruzamientos de caña de azúcar en el Centro de Investigaciones Agronómicas. (Sugar cane hybridization at the Centre for Agricultural Research.)

Agron. trop. Maracay, 1957, 7: 69-81, bibl. 6, illus.

Aims and methods described, and hybrids selected or under trial listed.

4507. ILAGA, M. T., AND OTHERS.

Preliminary report on the effect of varying concentrations of sulfurous and phosphoric acid and volume of the final solution on the preservation of arrowing and non-arrowing sugar cane stalks.

Sugar News, 1959, 35: 593-601, 649-54, bibl. 7.

The effects were studied of 3 concentrations of H_3PO_4 , 4 of SO_2 and 3 volumes of solution on the preservation of stalks in arrow containers. The amount of H_3PO_4 had little influence. The higher strengths of SO_2 (450 and 600 p.p.m.) and larger volumes (8 and 12 litres) of solution resulted

in better preservation of the sheath and blade moisture and in longer life of the arrows than the lowest strength (150 p.p.m.) and volume (5 litres).

4508. BREGGER, T.
Cane breeding for sugar, syrup, chewing and forage uses.

A.R. Fla agric. Exp. Stats, 1957-58, pp. 271-2.

An evaluation of 12 F. and C.P. series of seedlings.

4509. FAÑDINO LÓPEZ, L.
Origen de la caña P.P.Q.K. (The origin of the sugar cane variety P.P.Q.K.)
Bol. Asoc. Téc. azuc. Cuba, 1959, 18: 41-3, illus.

P.P.Q.K. (Pepe Cuca) was formerly known as San Agustín, and originated as a mutation from Media Luna Co. 13.

4510. APPAJI, V. K., AND THIRUVENGADAM, C. R.
Performance of certain new Coimbatore varieties of sugarcane.

From abstr. in *Madras agric. J.*, 1960, 47: 32.

Co. 785 and 658 suitable for the Nellikuppam area.

4511. V[ALLANCE], L. G.
Four new varieties—Q. 69, Q. 71, Q. 72, Q. 73.
Cane Grs' quart. Bull., 1960, 23: 92-4.

Q. 69 and 72 are markedly drought resistant, Q. 71 is outstanding for high early sugar content and Q. 73 is highly resistant to bacterial mottle.

4512. TABAYOYONG, F. T. AND OTHERS.
In the Philippines—drought severely damages cane growth.

Sugar J., 1959, 22(7): 21-6, bibl. 7.

Effects of the 1958 drought on the 1957-1958 and 1958-1959 sugar crops in the Victorias Milling District.

Sugar News, 1959, 35: 655-9, bibl. 7.

This record drought affected P.O.J. 3016, H. 37-1933, C.P. 29/116 and H. 32-8560 more severely than other, less widely planted, varieties. Little success was achieved by a rain stimulation project.

4513. GILL, H. S., AND SINGH, H.
Studies on physiological basis of drought resistance in sugarcane.

Indian J. Sugarcane Res., 1959, 4: 14-21, bibl. 16.

Of 6 common varieties grown with a highly restricted water supply Co. 312 proved to be the most xerophytic, yielding over 30% more than the next highest variety. Anatomically Co. 312 had smaller and fewer stomata, a thicker cuticle, fewer dead leaves and smaller variations in leaf and stem moisture contents. The roots of Co. 312 had more and larger vascular bundles, formed a greater proportion of the total weight and penetrated to a greater depth than those of the other varieties.—*Sugarcane Res. Stat.*, Jullundur, Punjab.

Sugar cane—planting and culture.

(See also 3672-3676, 4532.)

4514. RAO, M. S. S., PRASAD, R. B., AND KHANNA, K. L.

Studies in germination of sugarcane—the question of auxin relationship, polarity, position of the bud in the soil and internodal length as influencing it.

Indian J. Sugarcane Res., 1959, 4: 22-6, bibl. 34.

Soaking setts in IAA or NAA, both at 100 p.p.m., or in water for 15 minutes had no effect on germination. In 3-budded setts the middle bud showed the highest percentage germination and the bottom bud the lowest. Early germinating top buds produced the most tillers. Buds facing upwards in the soil showed the highest germination, followed by sideways facing buds, with downward facing buds the lowest. In 3-budded setts, however, two buds upwards and one downwards resulted in 10% more germination than all 3 facing sideways.—*Sugarcane Res. Inst. Pusa, Bihar.*

4515. TIPPANNAVAR, M. B., AND HIREGOUDAR, S. V.
The effects of soaking sugarcane setts in water and in Agallol solution on germination of sugarcane.

Mysore agric. J., 1959, 34: 63-6, bibl. 8.

Soaking setts in cold running water for 24 hours, or dipping them in 0.5% Agallol (an organo-mercurial compound) for 2 minutes both increased germination. A combined treatment was best and produced a 23.9% increase.—*Sugarcane Res. Stat. Mandya.*

4516. KULKARNI, K. R.
A preliminary study on weed control in sugarcane crop and accelerating cane germination.

Mysore agric. J., 1959, 34: 77-81, bibl. 7.

Dipping setts in the organo-mercurial compound Aretan (1 lb./40 gal.) improved germination, and spraying twice before germination with Fernoxone (Na salt of 2,4-D) at the rate of 1½ lb. a.e. per acre successfully controlled both broad-leaved and grassy weeds. Fernoxone had a slightly adverse effect on germination except when combined with the Aretan treatment.

4517. KANWAR, R. S., AND SINGH, H.
Manurial value of sanhemp (*Crotalaria juncea*)—its effect on soil composition, juice quality and yield of sugarcane.
Indian J. Sugarcane Res., 1959, 3: 194-201, bibl. 6.

Ploughing in the whole plant resulted in the greatest increase of N and organic matter in the soil, the increase being slightly greater after 90 days' growth by the crotalaria than after 70 days' growth. The application of P₂O₅ to the crotalaria at sowing

had no effect on this increase or on the subsequent cane crop, although the uptake of P by both crops was increased. Green manuring slightly delayed maturity in the ensuing cane crop but did not affect the sucrose content or the juice purity.—Sugarcane Res. Stat., Jullundur Cantt.

4518. BAINS, A. S.

Effect of spacing and seed rate on the growth and yield of sugarcane under varying levels of nitrogen.

Indian Sugar, 1959, 9: 329-30, 339-46, bibl. 11.

Spacing at 2 ft. gave significantly higher yields than spacing at 1 or 3 ft., but the widest spacing gave the highest number of tillers. A planting rate of 35,000 two-budded setts per acre produced greater yields than 25,000 or 30,000. The application of N increased tillering and growth as well as yield in both the plant and ratoon crops. Increases of 51.9 and 54.7% in the plant crop and 97.4 and 121.2% in the ratoon crop were given by 100 and 200 lb. of N per acre, respectively. The optimum conditions for the plant crop were 2 ft. spacing, a 30,000 planting rate and 100 lb. N. per acre; and for the ratoon crop the 35,000 planting rate with the same spacing and N dressing.—Sugarcane Res. Stat. Jullundur Cantt.

4519. CHANG, J. C. C.

A conclusive study of flooded paddy sugarcane in Taiwan. [Chinese, with English summary 1 p.]

J. agric. Ass. China, 1959, No. 27, pp. 63-74, bibl. 24.

Sugar cane for intercropping with rice should be planted either in the spring or the autumn, using 5-node cuttings in the spring and 2-node cuttings in the autumn. In both cases the tops of millable shoots provide suitable cuttings, which should be planted obliquely with their upper ends above the water. Irrigation for 4-8 days followed by drainage for 1-2 days was more suitable than continuous irrigation. After harvesting the rice, the stubble should be ploughed in and the sugar cane top-dressed with NPK fertilizers.—Taichung Sugar Factories Centre.

4520. ANON.

Helping the farmer to decide on spray irrigation.

S. Afr. Sugar J., 1959, 43: 979-87.

Advice on lay-outs, pumps, rainers, management of water and addition of fertilizers.

4521. SINGH, H., AND LAL, K.

Importance of irrigation for sugarcane crop for Bangar Tract of Ambala District, Punjab.

Indian J. Sugarcane Res., 1959, 3: 189-93, bibl. 5.

The effects and interactions of irrigation levels and N fertilizer were examined in 5 seasons. The irrigation treatments were: 3 (April, May and June.)

4 (as before but one extra in May) and none. The N levels were 0, 40 and 50 lb. per acre. The increases in yield of stripped cane per acre were significant for both treatments, the effect of irrigation being slightly greater than that of N. The highest level of N with 4 irrigations raised the yield to 240% of the control. Seasonal variations were also significant.—Sugarcane Res. Stat., Jullundur Cantt.

4522. RANGANATHAN, V.

A note on the hydration of cane sheaths as an indicator of maturity.

Indian J. Sugarcane Res., 1959, 4: 50-1, bibl. 2

The adjustment of irrigation to maintain a hydration level in the cane sheaths of about 280% for 2 months before harvest resulted in the highest sugar yield per acre.—Cent. Sugarcane Res. Stat. Cuddalore, Madras.

4523. THAKUR, C., AND MISRA, A.

Removal of late tillers of sugarcane and its effect on the quality and tonnage of the crop.

Indian J. Sugarcane Res., 1959, 4: 52-3.

In a crop harvested in January late tillers were removed monthly from September onwards and in other plots from October, November and December onwards. Compared with the control, in which late tillers were not removed, the September-onwards series showed a yield increase of 9% and there were also small increases in the other series. Sucrose contents also improved in the early series. The P content was highest in the September series and the protein content in the later series.—Sugarcane Res. Inst., Pusa.

Sugar cane—nutrition.

(See also 4498, 4499, 4517, 4518.)

4524. INNES, R. F.

The manuring of sugar cane.

Span, 1959, 2: 98-100, bibl. 2.

A short account of yield responses, placement and deficiency diagnosis.

4525. SAMUELS, G.

The influence of the age of sugarcane on its leaf-nutrient (N-P-K) content.

J. Agric. Univ. P.R., 1959, 43: 159-70, bibl. 9.

Leaf N and P contents both fell as the crop reached maturity, whereas leaf K, though falling at first, increased again as the plant approached maturity. For each element, irrigation decreased the rate of fall. There was no significant difference in the rate of N decline between 3 varieties tested. A table of suggested correction factors for age of sampling is given to assist foliar diagnosis.

4526. TABAYOYONG, F. T.

The effects of soil type and fertilization on the yield of cane in the Philippines.

Sugar News, 1959, 35: 543-50, bibl. 5.

Results of 7 years' experiments have shown that fertilization had a greater effect than soil type on yield, but neither affected the sugar content, although this showed a significant difference between varieties. The conditions producing the highest yields with 3 common varieties were as follows: with H. 47-1944, Guimbaloan clay loam soil and 120-120-240 kg./ha. of $N-P_2O_5-K_2O$; with C.P. 29/116, Luisiana clay soil with 120-100-180 kg./ha. fertilizer; and with P.O.J. 3016, Victorias sandy clay loam with 120-100-180 kg./ha. fertilizer.

4527. APACIBLE, A. R.

Fertility development at Canlubang Sugar Estate.

Sugar News, 1959, 35: 552-6, 604-16, bibl. 43.

The increase of nearly 180% in yield of sugar per ha. on this estate from 1948-1958 is ascribed to the proper use of fertilizers and to the variety P.O.J. 3016. Liming raised the soil pH from 5.25 to 5.58 in 3 years and the application of bagasse and factory wastes improved both the texture and nutrient status of the soil. It is considered that a maximum yield would be attained with dressings of 90 kg. N per ha. for the plant cane and 140 kg. for the ratoon crop. Detailed tables of production figures, fertilizer applications, rainfall, yields and soil analyses are appended.

4528. NARASIMHAM, R. L., RAO, N. V. M., AND RAO, W. T.

Uptake and utilisation of nitrogen by sugarcane as influenced by the time of application. 1. Plant composition in relation to yield of cane and sugar.

Indian J. Sugarcane Res., 1959, 3: 319-24, bibl. 12.

Ammonium sulphate at the rate of 100 lb. N per acre was applied to Co. 419 at periods ranging from 1½-6 months from planting. The highest level of nitrate-N in the soil was reached when the N was applied at 1½ months, the greatest uptake by the plant occurred when the whole dose was applied within 4½ months, and the highest yields of cane and sugar when it was applied within 3 months.—*Sugarcane Res. Stat.*, Anakapalle, A.P.

4529. PARISH, D. H., AND FEILLAFÉ, S. M.

Considérations sur la nutrition azotée et sur l'utilisation de l'urée dans la culture de la canne. (Observations on nitrogen nutrition and the use of urea in sugar cane growing.) *Rev. agric. suc. Maurice*, 1960, 39: 6-8.

Responses of yield, growth and plant N were significantly greater to ammonium sulphate than to urea when both provided 45 kg. of N per arpent [0.42 ha.]. The response to urea was no greater with 45 than with 30 kg. of N. In pot experiments there was no evidence of biuret toxicity after the application of urea to sugar cane. Transformation of urea into ammonium cyanate is unlikely in the

sugar cane soils of Mauritius, but losses due to leaching may occur.

4530. LELEY, V. K., AND AGASHE, S. D.

Mowhra cake as a nitrogenous fertilizer for sugarcane.

Indian J. Sugarcane Res., 1959, 4: 27-30, bibl. 13.

The pressed cake of *Bassia latifolia* seeds contains about 3% N and 0.6% P_2O_5 , but it decomposes exceedingly slowly in the soil, probably on account of the saponins present. Compared with a standard top dressing of sulphate of ammonia and groundnut cake, mowhra cake, both alone and combined with sulphate of ammonia, gave reduced yields in a 3-year experiment.—*Dep. Agric. Poona*.

4531. LAL, K. N. AND SINGH, J. N.

Effect of phosphorus deficiency on the carbohydrate fractions of component parts of sugarcane at successive stages of growth.

Indian J. Sugarcane Res., 1959, 4: 1-13, bibl. 12.

Phosphorus deficiency had no significant effect on the fructose, total reducing sugars and sucrose contents, but there was a tendency for the accumulation of sucrose and total sugars to slow down towards maturity. The effects of P and of plant age on sucrose accumulation are discussed.—*Banaras Hindu Univ.*

4532. KANWAR, R. S.

Some preliminary studies on the germination and tillering of sugarcane as influenced by minor elements.

Indian Sugar, 1960, 9: 563-9, bibl. 3.

Both foliar and soil applications were made of Fe, Cu, Mn, Zn, B, Mg and a mixture containing all 6 elements. Soil applications of Fe and the mixture improved germination, those of B reduced it, and those of Zn and Cu had no effect, whereas soaking the setts in solutions of these 2 latter was favourable to germination. Tillering was not influenced by any of the foliar applications, but soil treatment with B, Cu and the mixture considerably increased it during the pre-monsoon period, while Mg reduced it. These effects diminished from the onset of the rains and had almost disappeared when they ended.—*Sugarcane Res. Stat.*, Jullundur Cantt.

4533. DE, R., AND SINGH, R.

Effect of micronutrient elements on growth, yield and chemical composition of sugar cane.

Soil Sci., 1960, 89: 97-100, bibl. 10.

Foliar and soil applications of Fe, Cu, Mn, Zn, B, and a combination of all 5 elements were made in 2 successive years. In general, foliar application was the more effective method. Ferrous sulphate at 0.5% sprayed on the leaves significantly increased growth and gave 14.9% and 12.8% increases in

millable cane in the 2 seasons; these improvements were associated with greater N uptake and increased hexose synthesis. The foliar application of 0.3% boric acid significantly improved juice quality and cane maturity, as well as increasing sucrose synthesis in the leaves.—Sugarcane Res. Stat., Jullundur, Punjab.

Sugar cane—disorders, diseases and pests.

(See also 4498, 4499, 4597.)

4534. SINGH, M. M., AND SINGH, H.

Splitting in sugarcane varieties.

Indian J. Sugarcane Res., 1959, 3: 202-6.

Splitting was found to be a varietal characteristic, Co. 285 and 312 showing the greatest incidence and Co. 313, Co. L.9 and 29 being almost free from it. High humidity during the monsoon period appeared to be an important factor in promoting splitting.—Sugarcane Res. Stat., Jullundur Cantt.

4535. AHMED, [N.] J.

Preliminary study on the varietal resistance of standing cane to pineapple disease and the influence of the disease on juice quality.

Madras agric. J., 1960, 47: 8-15, bibl. 5.

Of 5 varieties tested Co. 658 was found to be the least susceptible to *Ceratostomella paradoxa*. The reduction in the CCS% of the juice caused by the fungus was insignificant in Co. 658 and 527, but highly significant in Co. 419, 449 and 1001.—Cent. Sugarcane Res. Stat., Cuddalore.

4536. AHMED, N. J.

Pineapple disease of sugarcane and its control: a preliminary study.

Indian J. Sugarcane Res., 1959, 3: 225-6, bibl. 3.

Organo-mercury compounds were found more effective than copper preparations for the control of *Ceratostomella paradoxa*, the germination of infected setts being increased 60.7% by treatment with Agallol.—Cent. Sugarcane Res. Stat., Cuddalore.

4537. YOUNG, H. E.

Nematodes and sugar cane.

Cane Grs' quart. Bull., 1960, 23: 98-100.

In soil fumigant trials at Bundaberg ethylene dibromide, DD and Nemagon all gave excellent control of nematodes at 5 gal. per acre. In the Mackay district DD at 20 gal./acre resulted in a yield increase of more than 10 tons per acre, but EDB at the same rate was less effective. In the same area Nemagon at 2.5 gal. per acre gave an increase of 9 tons per acre as against 6 tons for half this rate. Increases of 10-15 tons per acre were also obtained in the Lower Burdekin area by the use of 25 gal. per acre of DD. At Babinda 5 gal. per acre of Nemagon gave no better results than 2.5 gal., following which increases of 20 tons per acre were recorded.

4538. SIDDIQI, Z. A., RAJANI, V. G., AND SINGH, O. P.

Simultaneous control of sugarcane termite and shoot borers through soil application of gamma BHC liquid and its boosting effect on crop yield.

Indian J. Sugarcane Res., 1959, 3: 227-32, bibl. 15, illus.

A soil application of γ -BHC at 0.75 lb. per acre was the most effective method of controlling both termites and shoot-borers (*Chilotraea infuscatella*, *Raphimetopus ablutella* and *Emmalocera depressella*). In addition tillering and yields were increased. This effect on growth is considered to be due to the control of soil microfauna which damage eye buds and rootlets and are inimical to nitrifying bacteria.—Sugarcane Res. Stat. Shahjahanpur, U. P.

4539. MUTHUSWAMY, R.

Effect of soil application of insecticides on the premonsoon incidence of borers and germination of sugarcane in Eastern Uttar Pradesh.

Indian J. Sugarcane Res., 1959, 4: 31-5, bibl. 7.

Good control of borers (*Chilotraea infuscatella*, *Emmalocera depressella* and *Scirpophaga nivella*) was obtained by the application to the soil in the pre-monsoon period of 1 lb. of actual endrin and γ -BHC per acre. A considerable reduction of incidence occurred with 2 lb. aldrin and 1 lb. dieldrin, but Folidol was ineffective. Germination was significantly reduced by 2 lb. of aldrin, less by γ -BHC and was only slightly influenced by Folidol.—Begg, Sutherland & Co., Marhowrah.

4540. GUPTA, B. D.

The insect pests of sugarcane in India—V. The shoot borer, *Chilotraea infuscatellus* Snell.

Indian Sugar, 1959, 9: 445-8, 457-65, bibl. 27, illus.

Biological control of *C. infuscatella* by the parasite *Trichogramma* is not considered effective, and phytosanitary measures are recommended. Chemical control methods consist of working into the top soil 5 lb. of BHC dust per acre, spraying the setts in the furrows with 0.75 lb. BHC per acre, and spraying the crop at the 4th, 6th and 9th weeks with 0.32% DDT emulsion. [For part IV see *H.A.*, 30: 2987.]

4541. DAVID, H.

A preliminary study on the efficacy of soil application of B.H.C. emulsion in the control of early shoot borer (*Chilotraea infuscatellus* Snell).

Indian Sugar, 1959, 9: 387-8, bibl. 3.

The application of BHC at 5 lb./acre before planting gave better control than 10% dusts of chlordane and toxaphene applied at 20 lb./acre, and improved germination and final yields.

4542. CHARI, C. R.

Insecticidal trials of the control of early shoot borer, *Chilotræa infuscatellus* Snell, on sugarcane at Anakapalle.

Indian J. Sugarcane Res., 1959, 3: 215-18, bibl. 5.

An increase of 9.8 tons per acre was recorded when the crop was sprayed with 0.32% DDT 4, 6 and 9 weeks after germination, the timing being based on the period of rapid tillering and oviposition by the borer.

4543. MUNGOMERY, R. W.

The use of insecticides to control subterranean insects in Taiwan.

Cane Grs' quart. Bull., 1960, 23: 95-7, illus.

Aldrin and heptachlor dusts effective against wireworms, termites and soil-inhabiting borers.

4544. QUESTEL, D. D., GENUNG, W. G. AND BREGGER, T.

Studies upon the prevalence and control of the sugarcane moth borer in South Florida.

A.R. Fla agric. Exp. Stats, 1957-58, p. 262.

A 2% endrin dust gave good control; parasitism increased markedly.

4545. TOOHEY, C. L.

Control of the black beetle.

Cane Grs' quart. Bull., 1960, 23: 86.

A severe attack of *Heteronychus sanctae-helenae* was largely overcome by the application to the soil of $\frac{1}{2}$ lb. of 50% dispersible lindane in 100 gal. water at a rate of 44 gal. per acre, followed by a light rotary-hoeing.

4546. GUAGLIUMI, P.

Automeris illustris Wlk., (Lepid. Saturniidae), una nueva plaga de la caña de azúcar en Venezuela. (*Automeris illustris*, a new pest of sugar cane in Venezuela.) [English summary 7 lines.]

Agron. trop. Maracay, 1957, 7:151-7, illus.

With notes on hand collection and parasitism.

4547. ABBAS, H. M., AZIM, A., AND SHABBIR, S. G.
Sugarcane pyrrilla control by aircraft in Pakistan.

Agric. Pakist., 1959, 10: 339-50, bibl. 6.

Successful control of *P. perpusilla* was obtained in the nymphal stages by spraying 19.5% endrin e.c. (1 gal./10 acres) from aircraft, the spray being applied from a low height when the crop was not too thick. The end of May or the first week in June were usually satisfactory times. Aldrin and BHC 12% w.p. were not successful. The treatment cost Rs. 5 per acre, yields were increased and the sugar recovery rate increased from 7 to 9.5%.

Sugar cane—harvesting and by-products.

4548. ANON.

Production model of cane harvester on view.

S. Afr. Sugar. J., 1959, 43: 1048-51, illus.

Details and pictures of the first South African harvester, which can top, cut and lay cane at 2 acres per hour for 4d. per ton.

4549. VÁZQUEZ, E. A.

Un nuevo procedimiento para la obtención simultánea de azúcar, alcohol y pulpa de papel de la fibra de la caña de azúcar. (A new procedure for the simultaneous extraction of sugar, alcohol and paper pulp from sugar cane fibre.)

Bol. Asoc. Téc. Azuc. Cuba, 1959, 18: 617-22, 699-702, and 777-88, bibl. 6.

4550. LAMBERTON, J. A., AND REDCLIFFE, A. H.

Polymeric aldehydes in sugar-cane cuticle wax.
Chem. Ind. Lond., 1959, No. 52, pp. 1627-8, bibl. 3.

Tea—general.

4551. TRAMASURE, J.

De la feuille de thé au thé marchand. (From fresh leaf to manufactured tea.)
[Flemish summary 4½ pp.]

Bull. agric. Congo belge, 1959, 50: 1245-81, bibl. 2, illus.

Notes on manufacture are preceded by a description of Assam tea growing in Kivu under the headings: sowing, planting, pruning (for the establishment of a plucking table at 80-90 cm.) and plucking (normally to three leaves and the terminal bud).

4552. HUSSAIN, S. A. E.

Pakistan's tea industry.

World Crops, 1960, 12: 51.

A brief account.

4553. TEA RESEARCH INSTITUTE OF EAST AFRICA.

Annual Report of the Tea Research Institute of East Africa for the year 1958, Nairobi, 1959, pp. 49, illus.

Agricultural department: During the 3rd year after pruning the NPK trial on unshaded tea in Kenya, the 40 lb. N/acre plots gave 232 lb. per acre more made tea than the controls, and the 80 lb. N plots a further 169 lb. No further increase was obtained from a 120 lb. N level. Similar results were obtained in the Tanganyika trial, but in Uganda incremental responses up to 120 lb. N were obtained. Significant responses to P fertilization and mulching were recorded in the shade experiments, part of the latter effect being due to leaf fall from the *Grevillea* used. In NPKS and mulch experiments in Kenya and similar experiments in Tanganyika and Uganda, in which the mulch was replaced by Mg, only the N (at 40 lb. per acre) gave significant increases. Other long-term experiments

on fertilization and pruning methods were continued. *Chemical department*: after 5½ years of experimental treatment analyses of the Tanganyika 2⁵ fertilizer trial showed that the sulphate of ammonia applied had reduced the pH, K, Ca and Mg levels in the soil. Similar work on the Kenya plots indicated that these effects were partially offset by superphosphate treatment.

4554. NYASALAND.

Annual Report of the Tea Research Station, 1958-59, Zomba, 1960, pp. 27.

In 2 soil moisture studies the yield from unshaded tea was above average in spite of the severe drought of 1957. Of the various shade trees used *Albizzia gummifera* made the greatest demand on soil moisture. Down-pruning every 2nd year or clean pruning every 3rd year gave the highest yields of made tea per acre. In both NPK trials incremental dressings of 40 lb. N per acre gave significant increases in yield up to the 120 lb. level, whereas neither P nor K had any appreciable effect. The spacing experiments failed to show any significant influence of plant population on yield or any interaction between spacing and N fertilization. Unshaded tea and tea under *Grevillea robusta* significantly outyielded tea shaded with *Glyricidia maculata* and *Albizzia gummifera*. Where the light falling on green barked cuttings was reduced to $\frac{1}{10}$ of full daylight, more than 80% survived, compared with 64% of unshaded cuttings. Sphagnum moss proved much superior to vermiculite for enclosing air layers. An investigation into the poor colour of Nyasaland teas carried out at Cambridge University showed the main cause to be low polyphenol-oxidase activity.

4555. INDIAN TEA ASSOCIATION.

Annual Report of the Indian Tea Association, Scientific Department, Tocklai Experimental Station, for 1958 [1959], pp. 415.

Physico-chemical branch: Cover crops were able to obtain P from superphosphates but not from rock phosphate. Leaf analyses showed a marked uptake and accumulation of Cl in tea plants treated with ammonium chloride. *Botanical branch*: The investigation of sclereids as determinants in the taxonomy of *Camellia* was continued. Special articles on "Vegetative propagation of tea in Ceylon", by M. J. Green, and on "Shade tree tradition in tea gardens in northern India", the latter abstracted separately, are included in this section. *Agricultural branch*: Urea, as a source of N, was only effective as a foliar spray. Beneficial results were obtained from limited amounts of organic manures and from phosphate. In one of the experiments on pruning cycles higher yields were obtained from the unpruned trees, though with a tendency towards lower quality in the made teas. *Desmodium ovalifolium* is recommended as a cover crop, and,

because of its very rapid growth, *Albizzia richardiana* should be used as a temporary shade tree in a mixed stand. Tea cuttings were raised successfully in polythene tubes filled with soil. Single and triple sprays of dalapon at 4 lb. per acre controlled *Imperata* spp. effectively and tended to give higher yields. *Plant pathology branch—Entomological section*: Defoliation again proved successful in controlling red spider mites (*Oligonychus coffeae*), but the effects on the plants have not yet been fully evaluated. All acaricides tested gave adequate control of purple mites (*Calacarus carinatus*). Endrin was the only effective agent against looper caterpillars (*Biston supressaria*). Endrin, chlordane and toxaphene gave good control of the tea aphid (*Toxoptera aurantii*). *Plant pathology branch—Mycological section*: Formulations of pentachloronitrobenzene had no effect on root diseases. Special reports on "Investigations on tea flower disease" (abstracted separately) and the "Influence of Botrilex on soil microflora", by V. Agnihothrudu and H. K. Phukon are included. *Biochemical branch*: Investigations continued on the differences in the sugars, organic acids, anthocyanins and volatiles of Assam, China and southern types of tea. *Engineering branch*: Machines were tested for harvesting, withering, rolling, processing, fermenting and drying the leaf.

4556. TEA RESEARCH INSTITUTE OF CEYLON.

Annual Report of the Tea Research Institute of Ceylon for the year 1958, Talawakelle, 1959, pp. 84.

Agricultural chemistry: Accumulation of Cu in soils following repeated spray application to control blister blight. *Biochemistry*: The role of pectic substances in the quality of tea. *Technology*: There was little to choose between the liquoring characteristics of teas 1 year, 2 years and 3 years after pruning. *Entomology*: Studies on control of mites, nettle grubs, white grubs, lygus bugs and shot hole borers. *Pathology*: Control of blister blight with copper fungicides; the relationship between temperature and the occurrence of the phloem necrosis virus; and investigations on the causative agent of a new leaf disease designated the "oil spot" disease. *Physiology*: Pruning and pre-pruning trials; the effects of different methods of plucking; and shading experiments. *Vegetative propagation*: Soils from Guatemala grass plots with a pH below 5.0 were found suitable, tea soils were not. *Nematology*: Suppression of eelworm infestation by a cover crop of *Tagetes* spp.

4557. UNITED PLANTERS' ASSOCIATION OF SOUTHERN INDIA.

Annual Administration Report of the United Planters' Association of Southern India, Scientific Department (Tea Section), for 1958-1959, Coonoor, pp. 45.

The addition of supplementary P (200 lb. P_2O_5) and K (600 lb. K_2O) every 3rd year having had no appreciable effect on yield in $7\frac{1}{2}$ years the experiment was terminated. A significant depressing effect on yield was obtained from 60 lb. of K_2O per acre applied alone. Dalapon proved a promising herbicide for the control of grass under the bushes and for the defoliation of dadap trees (*Erythrina lithosperma*). A mixture of IBA + NAA was the most effective aid to rapid rooting of cuttings. A 14-day plucking round was inferior to a 7-day round in total yield of tea. [See also separate abstracts.]

Tea—propagation, environment and growth.

4558. G[REEN], M. J., AND G[LOVER], P. M.
Care and maintenance of tea seed bars [gardens].
Ser. Tea Res. Inst. Tocklai 22/2, revised 1959, pp. 5.

Including disease and pest control.

4559. WATANABE, A., AND HARADA, S.
The effect of slip treatment upon root formation and growth of tea cuttings of several varieties. (Part 1). [Japanese, with English summary 12 lines.]
Study of Tea, 1959, No. 21, pp. 1-7, bibl. 2.

With normally shy-rooting varieties hormone treatment improved rooting and growth. Cuttings with 4 leaves did better than cuttings with fewer leaves.

4560. G[LOVER], P. M., D[UTTA], S. K., AND M[ACALPINE], R. I.
Silviculture of shade.
Ser. Tea Res. Inst. Tocklai 111/1, revised 1959, pp. 5.

Advice on growing shade trees, mainly *Albizia* spp. from seed, for tea plantations.

4561. WIGHT, W.
The shade-tree tradition in tea gardens of northern India. I. The value of shade. II. The use of ammonium sulphate. III. Superphosphate and light intensity.
A.R. Indian Tea Ass., Sci. Dep., Tocklai, 1958, pp. 75-98, bibl. 20, 99-122, bibl. 8, 123-50, bibl. 18.

I. Earlier experiments with sau (*Albizia chinensis*) shade trees and more recent work are evaluated. It has been shown that a reduction in illumination intensity greatly increases the yield of Assam tea. A greater uptake of N and other nutrients is obtained from organic compounds, which are only soluble with difficulty and which perhaps may be lignoproteins. The uptake of N by fungal symbionts and mycorrhiza may also be influenced by light intensity. Tea prunings were found to be a

necessary addition to the soil, but the use of sau trees for shade had an additional nutritional value not obtained from the prunings. II. Sulphate of ammonia at 1000 lb. per acre per annum increased yields by about 10-20%. Combining sulphate of ammonia with sau shade has given even greater yield increases, the effect of the two treatments being equal to the sum of the effects of either treatment alone. With screens for shade, however, the crop increases were less than those given by sau trees, and the combined effect of screens and sulphate of ammonia was less than the sum of the separate effects. Both sau shade and sulphate of ammonia had a greater effect on the bush area than on yield, but this depended on the maturity of the bushes and the planting density. III. The results of non-replicated experiments described in the 3rd part lead the author to conclude that P and possibly Ca are necessary for the efficient utilization of N under shade, since superphosphate proved to be as effective a fertilizer as ammonium sulphate under both sau trees and screens.

4562. G[LOVER], P. M.
Drought.
Ser. Tea Res. Inst. Tocklai 60/1, revised 1959, pp. 6.

Advice on ways of mitigating drought effects.

4563. TAKAHASHI, T., AONO, H., AND YANASE, Y.
Studies on frost damage of tea. Part 4. On re-sprouting and growth of the tea bud after frost damage and the effect of growth promoting treatment on the regenerating bud. Part 5. On the influence of direct covering on the air and leaf temperatures under the covering. [Japanese, both with English summaries $\frac{1}{2}$ p.]
Study of Tea, 1959, No. 20, pp. 10-18, bibl. 6, illus., and No. 21, pp. 7-12, bibl. 2, illus.

Part 4. Frost damage was simulated by dis-budding, after which, if the treatment was not too drastic, new buds developed from the damaged bud and from lateral buds on the damaged stem. If the dis-budding was severe, adventitious buds on old stems sometimes developed. The injury delayed plucking by 10 to 45 days, the delay being least when it occurred at the 1-2 leaf stage and greatest when it occurred at the 3-4 leaf stage. The later the injury, the lower was the yield and the N content of the leaf. The application of ammonium sulphate and spraying with GA promoted the growth of the surviving buds and lengthened the internodes of the lateral buds without affecting the weight and number of leaves. GA reduced the delay in plucking by 2 days, and the ammonium sulphate by a further 2 days; the former, however, caused a slight decrease in the N-content of the leaves. Part 5. It is reported that mats held 60 cm. above the bush gave better frost protection than mats laid on top of the bush. During a frost of $-6^{\circ}C$. damage occurred with

both methods of covering, but was less severe with the raised covers. [For part 3, see *H.A.*, 29: 3060.]

4564. TORII, H., AND NAKAGAWA, M.

Growth promoting effect of gibberellin on the tea shoot. [Japanese, with English summary $\frac{1}{2}$ p.]

Study of Tea, 1959, No. 20, pp. 19-23, bibl. 2, illus.

Considerable growth stimulus of young shoots was observed when the plants were sprayed with GA, but leaf number, weight and yield were unaffected. The main effects were longer internodes and thinner and more fragile stems. The optimum concentration appeared to be 50-100 p.p.m., and, although 3-9 sprayings were made, 2-3 are thought to be adequate. The addition of urea to the spray had no effect on the 1st crop but resulted in higher yields and stem lengths in the 2nd crop; however, certain undesirable chemical effects were noted. The GA treatment reduced the chlorophyll content of the leaves, without noticeably affecting the colour of the subsequent tea. It also affected the total N and caffeine contents but not the tannin content or the flavour.

4565. HARADA, S., KANÔ, T., AND SAKAI, S.

Studies on carbon assimilation in the tea plant. Part 3. On carbon assimilation in the mature tea garden. [Japanese, with English summary $\frac{1}{4}$ p.]

Study of Tea, 1959, No. 20, pp. 6-9, bibl. 5.

After espalier training the rate of photosynthesis decreased and the midday rest was marked. The rate reached its maximum when the shoots had developed 4 or more leaves before plucking. Optimum light intensity at sprouting time or after espalier training was 0.5 cal./cm²/min.; but before plucking this rose to more than 1.0 cal./cm²/min. Apart from the midday rest no depression of the rate resulting from high light intensity or temperature change was observed before plucking. [For part 2, see *H.A.*, 28: 1969.]

4566. TAKAHASHI, T., AND YANASE, Y.

Study on flower bud differentiation in the tea plant. Part 2. The influence of plucking on flower bud differentiation. [Japanese, with English summary $\frac{1}{4}$ p.]

Study of Tea, 1959, No. 20, pp. 1-5, bibl. 1.

Significant varietal differences were observed in the number of flower buds on the branches and shoots of normally plucked plants. The flower buds on shoots with only 2 nodes left after plucking were much fewer in number than on shoots with 4 or more nodes. The application of α -NAA to the plucked shoot caused an increase in the differentiation of flower buds on the 2-node shoots and inhibited the growth of lateral shoots. [For part I, see *H.A.*, 28: 3161.]

Tea—nutrition.

(See also 4561.)

4567. DUTTA, S. K., AND SHARMA, K. N.

Manuring of green crops used in tea culture.

Emp. J. exp. Agric., 1960, 28: 53-8, bibl. 13.

In an experiment involving 3 levels of P and K and 2 of Ca applied to *Crotalaria anagyroides* 80 lb. of P₂O₅ per acre was most beneficial. An additional 40 lb. of K₂O per acre increased the seed yield but not the weight of green material.

4568. DUTTA, S. K.

Manures in tea.

Two and a Bud, 1959, 6(3): 9-13.

Manuring schedules for all stages of tea and most soil types in Assam. [See also *H.A.*, 29: 9601.]

4569. GOLETIANA, G. I.

Effect of continuous application of fertilizers on the properties of krasnozems and the productivity of tea plantations. [Russian?]

Pochvovedeniye, 1958, 2: 139-46, illus., from *Biol. Abstr.*, Sect. D, 1960, 35, Abstr. 14,344.

Investigation of the soils of experimental plots in different ecological zones of the moist subtropics shows that continuous applications of fertilizers on tea plantations causes the accumulation of humus and increases the total soil N content and cation-exchange capacity. The high content of tannins, especially in the fallen leaves, is a source of energy for the micro-organisms and assures the predominant development of fungi in the surface soil. Continuous applications of physiologically acid fertilizers on tea plantations increase acidity of the soil to a pH of 3.8 to 4.5 and favourably affect the growth of the tea.—Kutaisi agric. Inst., U.S.S.R.

4570. MIRZOJAN, A. T.

The effectiveness of nitrogen fertilizers in tea plantations. [Russian.]

Izv. Akad. Nauk AzerbSSR, Ser. biol., 1959, No. 4, pp. 109-14, bibl. 1.

The best quality leaf and the highest yields of tea were obtained with applications of ammonium sulphate and ammonium nitrate at the rate of 360 kg./ha. in fully grown plantations and at 180 kg./ha. in young plantations. The application of 360 kg./ha. of N decreased the content of tannins and extractives but increased slightly the content of caffeine in the leaves.

4571. G[OODCHILD], N. A.

A note on the relative effectiveness of sulphate of ammonia and urea as fertilizers for tea.

Quart. Circ. Tea Res. Inst. E. Afr., 1959, 2: 62-3.

Sulphate of ammonia was more effective and consistent than urea in increasing yields. Urea only gave a reasonable response in the 3rd year after pruning, and then only 60% of that obtained from ammonium sulphate.

4572. GUSEJNOV, R. K.
The effect of superphosphate on tea plantations in the Lenkoran zone. [Russian.] *Izv. Akad. Nauk AzerbSSR, Ser. biol.*, 1959, No. 6, pp. 111-22, bibl. 13.
 Irrigated tea growing in a heavy yellowish podzol soil made the best growth when manured annually with 180 kg. of P_2O_5 per ha. Unirrigated tea on a less heavy podzol soil responded best to 90 kg./ha./year. After 8-10 years biennial applications of P_2O_5 would appear to be adequate. [See also *H.A.*, 29: 3057.]
4573. KAWAI, S., ISHIGAKI, K., AND TAKAYANAGI, H.
Studies on nutrient deficiencies in the tea plant. (Part 2). Effect of nutrient deficiencies on mineral contents in the tea leaf. [Japanese, with English summary $\frac{1}{4}$ p.] *Study of Tea*, 1959, No. 21, pp. 60-3, bibl. 12, illus.
 The symptoms of N, P, K and Mg deficiencies in tea and culture were similar to those reported for water culture [*H.A.*, 27: 2966]. In the plant the content of the mineral not supplied decreased, and this influenced the uptake of the other minerals. This was most marked in N-deficient plants, in which other minerals were abnormally high early in the experiment and much decreased after 3 years.
4574. KAWAI, S., AND IKEGAYA, K.
Studies on the interrelations of various ions in nutrient absorption by the tea plant. Part 2. Interrelations of N, P, K, and Mg in water culture solution, supplied with ammonium sulphate as the nitrogen source. [Japanese, with English summary $\frac{1}{4}$ p.] *Study of Tea*, 1959, No. 20, pp. 72-6, bibl. 11.
 Increasing the concentration of salts in the culture solution increased the uptake of phosphorus, divalent cations being more effective than univalent cations in this respect. On the other hand, increasing the P content of the solution reduced the uptake of Ca and Mg. Although antagonism between K, Ca, and Mg was observed, a rise in the Mg content of the solution was accompanied by increased absorption of K by the plant. [For part 1 see *H.A.*, 28: 1976.]
- Tea—diseases and pests.*
 (See also 4558, 4621.)
4575. SEN, A. R.
Pest and disease surveys [on tea]. *Two and a Bud*, 1959, 6(4): 16-22.
 Results indicated successful control measures in 3.3% of all gardens affected by red rust, 85.7% by black rot, 87.0% by red spider mite and 92.9% by copper caterpillar. For the more severely affected gardens, however, the percentages were 33.3, 100, 87.7 and 80, respectively.
4576. DAS, G. M., SARMAH, K. C., AND AGNIHOTHRUDU, V.
Phytosanitary measures in tea during the dormant season. *Two and a Bud*, 1959, 6(3): 14-19.
 General advice on plantation sanitation.
4577. SARMAH, K. C.
Diseases [of tea] in relation to drainage. *Two and a Bud*, 1959, 6(4): 11-15.
 Disease organisms induced or favoured by water-logging or inadequate drainage include *Colletotrichum camelliae* and *Pestalotzia theae* on the leaves, *Cephaleuros parasiticus* on the stem, *Pythium* spp. on the collar and *Sphaerostilbe repens* on the roots [see also *H.A.*, 30: 1420].
4578. FASSI, B.
 La lutte contre les pourridiées du théier au Kivu. (**Control of tea rots in Kivu.**) *Bull. Inf. I.N.E.A.C.*, 1959, 8: 317-30, bibl. 3, illus.
 The commonest pathogens are *Rosellinia necatrix* and *Armillaria mellea*. *Rosellinia bunodes* and *Fomes noxius* have also been observed. Preventive measures include felling the forest before planting tea and removing the tree roots from the soil, keeping the tea shade light by removing young trees or old dying trees, and removal of anti-erosion hedges of woody species such as *Leucaena*, which are regularly cut back and may form foci of infection. Direct control consists of the removal by excavation of diseased tea bushes showing symptoms in their aerial parts and of surrounding tea bushes showing infection of the collars and upper roots, complete with their root systems in both cases, and of the diseased parts of the roots of recently infected bushes adjacent to these.
4579. JAYARAMAN, V., AND RAM, C. S. V.
Control of blister blight of tea in Southern India—the 1958 field trials. *A.R. U.P.A.S.I., Tea sci. Sect.*, 1958-59, pp. 28-35, bibl. 8.
 Fungicides containing 50% copper, either as oxide or oxychloride, or 45% metallic copper were satisfactory at 6 oz. per acre. Colloidal copper containing 21% of copper was also effective at the same rate. Perenox at 3 oz. per acre gave adequate protection.
4580. RAM, C. S. V., AND JAYARAMAN, V.
The relation of interval between fungicide application to the control of blister blight disease of tea plants. *A.R. U.P.A.S.I., Tea sci. Sect.*, 1958-59, pp. 36-41, bibl. 9.
 Perenox and Blitox 50 were applied at 6 oz. per acre at 7-, 10- and 14-day intervals. Where infection was severe, even the 7-day spraying gave only slight protection; otherwise there was little difference in control between the treatments, with

the exception of Blitox at 14-day intervals, which was significantly less effective.

4581. RAM, C. S. V.

The relation of interval between fungicide spraying on tea leaves and subsequent washing by simulated rain to blister blight infection.

A.R. U.P.A.S.I., Tea sci. Sect., 1958-59, pp. 42-5, bibl. 2.

Using Blitox 50 as the fungicide, the incidence of *Exobasidium vexans* was significantly reduced even when the equivalent of 0.1 in. of rain was applied immediately after or within 2-3 minutes of treatment. Maximum protection was achieved when the interval was extended to 7-8 minutes; at this point it reached the figure obtained without washing.

4582. AGNIHOTHRUDU, V., BARUA, G. C. S., AND BARUA, K. C.

Investigations on tea flower disease.

A.R. Indian Tea Ass., Sci. Dep., Tocklai, 1958, pp. 255-68.

Examination of sectioned tea flower styles showed that, even with a 6-hour lead, hyphae of *Botrytis* sp. were unable to reach the ovary before germinating pollen tubes, and were incapable of inhibiting pollen germination. Fernide (TMTD) at 120 p.p.m. effectively controlled this fungus, whereas the LD 50 for pollen germination *in vitro* was 12,000 p.p.m.

4583. DAS, G. M.

Occurrence of red spider mite in relation to cultural practices in North-East India.

Two and a Bud, 1959, 6(4): 3-10, bibl. 6.

Figures are given to illustrate how deep skiffing, late pruning and thorough cleaning out reduce infestation by *Oligonychus coffeae*. Defoliation and shading also reduce the incidence of this pest. [See also *H.A.*, 30: 1422.]

4584. MUKERJEA, T. D.

New pesticides [for tea].

Two and a Bud, 1959, 6(4): 23-31.

Tedion and Kelthane proved to be more efficient acaricides than Akar and malathion, but the residual effect of Kelthane after one month was lower than that of Tedion. As an insecticide used to control looper caterpillar endrin at 1/1000 to 1/2500 was more effective than DDT 50% w.p. at 1/200. There was no significant difference in control of blister blight by 8 proprietary copper fungicides, all being highly effective. Among nematocides Nemagon, Nematox and Basudin 20 e.c. used as pre-sowing soil fumigants significantly increased the number of transplantable seedlings, whereas Sistan had no effect.

Tea—processing and composition.

4585. CHANDA, N. B.

Relationship between moisture contents of green and withered leaves and percentage wither.

Two and a Bud, 1959, 6(3): 20.

Percentage wither = $96 \times \frac{\% \text{ dry matter in green leaf}}{\% \text{ dry matter in withered leaf}}$.

4586. DŽEMUHADZE, K. M., NESTJUK, M. N., AND MILEŠKO, L. F.

Catechins and flavonoids of some teas of the Chinese People's Republic. [Russian, with English summary ½ p.]

Biohimija, 1960, 25: 349-54, bibl. 9.

The contents of flavonoids and individual catechins differ in the 5 commonest types of tea produced in China. The highest contents were found in non-fermented green tea. Then came the teas which are cured but not fermented, such as Lunczin and Bajča, which showed some changes in the catechin fractions. Poorest in both catechins and flavonoids was the completely fermented black tea. In Ulun [Oolong] tea, which is partially fermented, the contents of flavonoids and especially of catechins were generally high, but with some marked reductions in some of the catechins, in particular L-epigallocatechin gallate.

Sundry crops.

4587. ABRAMS, R., AND JACKSON, G. C.

Influence of root-inducing substances and time intervals on the rooting of acerola cuttings.

J. Agric. Univ. P.R., 1959, 43: 152-8, bibl. 4.

Rooting of terminal hardwood cuttings, taken in mid-May and trimmed to 8 in., was significantly increased by dipping the ends in IBA powder. Eight weeks was better than 6 or 10 weeks for rooting in sand. The use of IBA and NAA significantly increased the number of roots per cutting.

4588. ROLDÁN, J.

Parathion-residue studies on acerola.

J. Agric. Univ. P.R., 1959, 43: 147-51, bibl. 8.

Parathion applied at the rate of 1.5 lb. of 15% w.p./100 gal./acre at blossom time, or in split applications up to 20 days after blossoming, was rapidly decomposed, and none was detected on the fruit 11 days after spraying.

4589. ASENJO, C. F.

Vitamin C in acerola and rose hips.

J. Agric. Univ. P.R., 1959, 43: 212-13, bibl. 5.

Published figures reviewed; acerola ranks higher in ascorbic acid content.

4590. PAL, P

Developmental studies. V. Di-, tri- and tetrachotomous branching system in *Carissa carandas* Willd.

Proc. Indian Acad. Sci., Sect. B, 1960, 51: 116-21, bibl. 2, illus.

4591. VENKATARATNAM, L., AND SATYANARAYANA-SWAMY, G.
Top-working custard apples (*Annona squamosa* L.).
J. hort. Sci., 1960, 35: 1-5, bibl. 2, illus.
 Top-working custard apples (*A. squamosa*) and Atemoyas (*A. squamosa* × *A. cherimola*) proved feasible when shield-buds without wood were used. Cutting the trees back to 3 ft. from ground level proved the optimum height for securing a strong framework with a well-shaped tree. Pruning in January and budding in April gave the best results on top-worked trees in the Deccan tract. Custard apples on a vigorous rootstock like the atemoya came into bearing in the following season, whereas Atemoyas on custard apple rootstocks only did so in the second year. [From authors' summary.]—*Dep. Agric.*, Hyderguda, Hyderabad.
4592. TANCHICO, S. S., AND MAGPANTAY, C. R.
Analysis and composition of nanka (*Artocarpus integra* Merr.) latex.
Philipp. J. Sci., 1958 (issued 1959), 87: 149-58, illus.
 Jackfruit latex contained mainly resins (71.77%) and no proteins, carbohydrates, tannins or solid waxes. Detailed chemical data are recorded.—*Inst. Sci. Tech.*, Manila.
4593. FERREYRA, R.
Nueva fuente natural de vitamina C. (A new natural source of vitamin C.)
Bol. trim. Exp. agropec. P.C.E.A., Lima, 1959, 8(4): 6-9, bibl. 2, illus.
4594. WHITEHEAD, C.
The rambutan, a description of the characteristics and potential of the more important varieties.
Malay. agric. J., 1959, 42: 53-75, bibl. 7, illus.
 Of 32 recognized varieties, 11 of the more important are described in detail with information on their canning quality. Yields during the first 10 years of a variety trial are presented. In this trial bud-grafted trees on seedling rootstocks were planted 30 ft. apart, grassed down and dressed 3 times a year with a compound fertilizer high in N.
4595. JAUHARI, O. S.
Some observations on vegetative propagation of *Ziziphus mauritiana*, Lam. (Ber) from gootees and cuttings with the aid of growth regulators.
Curr. Sci., 1960, 29: 30-1, illus.
 The application of a mixture of IBA and NAA, each at 10,000 p.p.m., to 1-2-year-old shoots, followed by enclosure in moss and a plastic wrapping resulted in profuse rooting in 2 weeks. Ringed and unringed cuttings dipped in 200 and 400 p.p.m. NAA showed excellent root initiation, which reached 100% in the unringed cuttings treated with 400 p.p.m.

NOTES ON BOOKS AND REPORTS.

Books.

4596. BARNES, A. T.
The dahlia grower's treasury.
 Collingridge, London, Transatlantic Arts Inc., Florida, revised edition 1960, 9 × 6 in., pp. 160, illus., 21s.
 The dahlia is such a familiar plant, its simple requirements so well known that it might be wondered what to put in a book about them that is not already common knowledge. A glance through the pages of Mr. Barnes' book will soon dispel that idea. His book is not just limited to the cultivation of dahlias. It is *all* about dahlias, and that, it will be found, is quite a piece. The first beginnings of the dahlia are lost in the mists of antiquity though it seems that the Aztecs had a word for it. From the time when the mists begin to clear, about 1570, Mr. Barnes takes up the tale, tracing the development of the plant from its original small single flowered form to the large assembly of forms and varieties, colours, shapes and sizes that exists today. That is by way of overture. The rest is a very thorough exposition of the dahlia from chromosome to exhibition bench. There is even a chapter entitled "The dahlia in floral art", which sounds as if it was about pictures but is really a well-illustrated article on how to arrange this often top-heavy flower with lightness and grace. The reader, whether pro- or anti-dahlia, and the latter do exist, will not fail to be impressed by the author's knowledge, which is extensive and much of it peculiar to himself garnered during a lifetime spent among the plants as breeder, grower and exhibitor. A book to be recommended.
 G.St.C.F.
4597. BECKER, E. C., AND OTHERS (EDITORS).
Proceedings of the Tenth International Congress of Entomology, Montreal, August 17-25, 1956, 1958, 4 Vols, 10 × 7 in., pp. 941, 1055, 895, 1115, bibls, illus., \$75.00
 Volume 1 contains no papers of horticultural interest. In volume 2 the Ecology section contains one paper on population studies of mites on citrus and avocado pears. In volume 3 the *Agricultural entomology* section has 4 papers on the control of fruit flies, 2 papers on the control of vegetable pests

by seed and soil treatments, 6 papers on the effects of sprays and other factors on the fauna of apple and citrus trees, 5 papers concerning virus vectors on horticultural crops, and 16 assorted papers on various horticultural topics ranging from the control of the carrot fly, the narcissus bulb fly and mushroom pests to the scope for using vegetable oils as insecticides and the integration of biological and chemical control of insect pests of cabbage. In volume 4 the *Biological control* section contains 12 reviews of work on pests of horticultural crops, 11 papers dealing with the mites of apple, peach and citrus trees, 3 papers dealing with pest control in horticultural crops with the aid of insect pathogens and 6 papers on the biological control of pests of various horticultural and plantation crops, including sugar cane. The *Agriculture* section includes 3 papers on pollination in orchards and 2 on nectar plants.

4598. DOREY, R.

Tomato growing by prescription.

Blandford Press, London, 1960, $8\frac{1}{2} \times 6$ in., pp. 167, illus., 18s. 6d.

Far too many books on the culture of specific crops repeat previous writing and contain a mass of recommendations unsupported by proven fact. This book has a refreshingly new and stimulating approach. The author, trained as a chemist but now a grower in Guernsey, approaches the subject with precision and discipline in an attempt to replace uncertainty and guesswork with sound, factually based advice. If the tomato grower of today is to surmount the economic difficulties with which the industry is faced, he must understand more clearly how his plants work, how they are affected by environmental conditions and how he can control the environment to best effect. Although the basic framework of the book is a digest of the experimental work carried out on the tomato crop since the war, it is essentially written for the grower rather than for students or workers in the experimental or advisory fields.

There is little in the text demanding criticism, though the author is in error in stating that seed from infected fruit carries little virus after it is dried. Virus remains active in the seed coat for periods of well over a year and it is by no means certain that it can be fully inactivated by soaking in 10% trisodium phosphate. The illustrations are generally good, with the exception of Fig. 29, which inaccurately represents the structure of a tomato flower (the style being much too long in relation to the anthers), and the the colour plates, which are so poor that they could well have been left out.

G.F.S.

4599. F.A.O.

Poplars in forestry and land use.

F.A.O., Rome, 1958, 9×6 in., pp. 511, bibl. $12\frac{1}{2}$ pp., illus., 17s. 6d.

This extensive work on a genus of great current interest was prepared by the International Poplar Commission. After a general introduction, pages 11–81 deal with classification, identification and distribution. Pages 82–274 cover cultivation and deal with nursery practices and the management of poplars, whether as amenity trees, as windbreaks, as pure stands or in combination with agricultural or horticultural crops. This extensive section includes a part on the economics of poplar growing. Insect, rodent and other pests and fungal, bacterial, virus and other diseases are systematically dealt with on pages 275–359. Control measures are given where known. Genetics and the aims and methods of breeding are covered in pages 360–396. The concluding section, pages 397–489, deals with the characteristics, the exploitation and the utilization of poplar wood. A list of species, varieties and cultivars, and one of pests and diseases complete this very useful work.

4600. PAWSON, H. C.

Cockle Park Farm. An account of the work of the Cockle Park Experimental Station from 1896 to 1956.

Oxford University Press for the University of Durham. London, 1960, 9×6 in., pp. 261, illus., 35s.

Although the investigations carried out at Cockle Park have little direct bearing on horticulture, this story of the station, its origins, vicissitudes, personalities and achievements is of very considerable interest to all scientists whose work is connected with the land. Cockle Park is one of the oldest centres of agricultural research in Britain and, as such, is a scientific ancestor of all present-day research stations.

This book contains an account of the main research conducted over the years at Cockle Park, particularly that connected with the improvement of rough pasture and hay. It is well printed and illustrated and provides a suitable permanent record of 60 years of most valuable research and achievement.

4601. PIRONE, P. P., DODGE, B. O., AND RICKETT, H. W.

Diseases and pests of ornamental plants.

Ronald Press Company, New York, 3rd edition 1960, 9×6 in., pp. 775, illus., \$10.

The popularity of this book in the United States is reflected by the fact that this is the 3rd edition, although the present reviewers are not acquainted with the earlier editions. Its contents embody the results of years of practical experience of the staff of the New York Botanic Garden as well as the research of other prominent workers in America. It deals only with plants of ornamental value, and it is unfortunately true that, although several smaller books embracing this subject have appeared in Britain in recent years, there has not been one which is comparable in scope to this one. It is

a huge subject to cover even for such a large book and therefore a very terse style of writing has had to be adopted. This has somewhat reduced the value of the descriptions of symptoms and the control recommendations.

As with many recent books of this type the contents are divided into two parts, the first of which treats the subject generally while the second is essentially a review of the troubles affecting 500 ornamental plants which are listed in alphabetical order according to their botanical names. Part one contains information, written in a semi-popular style, on the various symptoms exhibited by plants attacked by parasites or damaged by adverse environmental factors (frost, sun scorch, mineral deficiencies, etc.), together with some details of the pathogenic organisms themselves. Also in this section are details of modern control measures, including hygienic garden practices, the use of resistant plants and the application of modern chemicals. The last item is surprisingly brief, considering the enormous number of chemicals which have been developed in the United States in recent years.

In Part II, which comprises the bulk of the book, the diseases, pests and physiological disorders of each plant are dealt with under the generic name of the host. Many of the plants are strange to British readers and some are of doubtful ornamental value. However, it must be remembered that even the pests and diseases of weeds are of interest to the pathologist. In our view, however, it would have been more helpful for reference purposes, if, where a plant is susceptible to a large number of troubles, the authors had arranged them in taxonomic or alphabetical order instead of the rather haphazard method followed.

This book represents a great deal of work and contains much useful information. The print is clear, the paper is good, the index is comprehensive and the illustrations, 221 altogether, are excellent; but by British standards the price is high. Allowing for the fact that many of the pests and diseases are not found in this country and that some common British troubles are not included, this book is well worth a place in the library of a student of plant pathology, but it is doubtful if the average British grower would find it very useful.

D.E.G. and P.B.

4602. RUHLAND, W., AND OTHERS (EDITORS). *Handbuch der Pflanzenphysiologie. Band XI. Heterotrophie. (Encyclopedia of plant physiology. Vol. 11. Heterotrophy.)* Springer-Verlag, Berlin, Göttingen and Heidelberg, 1959, 10 × 6½ in., pp. xxv + 1033, bibls, illus., DM. 248 (subscription DM. 198.40).

The subject matter of this book is divided into sections as follows:—1. Introduction. 2. The use

of mutants in the study of metabolism. 3. The uptake of water and mineral substances by hemiparasites. 4. Physiological-chemical problems of heterotrophy. 5. The biology of the heterotrophics. 6. The microbiology of natural substrates. 7. Humus: its composition, properties and plant physiological effects. 8. The significance of the heterotrophics for the circulation of matter. About one-half of the sections or sub-sections are written in English. There is an extensive subject index in German and English. [For other volumes in this series see *H.A.*, 29: 975, 1992, 4133 and earlier.]

4603. UPHOF, J. C. T.

Dictionary of economic plants.

H. R. Engelmann (J. Cramer), Weinheim (Bergstrasse), W. Germany, Hafner Publ. Co., New York, and Wheldon and Wesley, Ltd., Coticote, England, 1959, 9½ × 7½ in., pp. 400, bibl. 10 pp., £3 8s.

In this most useful handbook the species are arranged in alphabetical order with brief descriptive notes, including geographical habitat and uses. For the more important plants additional information is given on the characteristics of the product. English common names are also included, cross-referred to their scientific names. Relatively small in volume by reason of rather small print and thin paper, this dictionary contains an immense quantity of information.

Annals and reports.

(See also 4085, 4160, 4423, 4433, 4466, 4477, 4498-4500, 4503, 4553-4557.)

4604. ALBERTA.

Annual Report of the Department of Agriculture of the Province of Alberta for the year 1958, 1959, pp. 211, illus.

Including propagation and selection of top and small fruits and vegetables at the Horticultural Station, Brooks (pp. 36-43).

4605. ALM. DANSK GARTNERFORENING. (SENNELS, N. J., AND PEDERSEN, K.)

Årbog for Gartneri, enogfyrretyvende årgang 1959. (41st Danish Horticultural Yearbook 1959.)

S. L. Møllers Bogtrykkeri, Copenhagen, 1960, pp. 182, kr. 5.

As in earlier editions the present yearbook begins with a comprehensive directory and extensive statistics of Danish horticulture. This is followed by reports of small-scale manurial, cultural and plant protection trials with fruit, vegetable and ornamental crops and of the application and results of soil analysis. A pump circulating the hot water in a glasshouse is described. The ornamental section is chiefly devoted to tests of dahlia, polyanthus and polyanthus hybrid varieties. The 40th Annual Report of the Committee for Vegetable

Variety Trials (pp. 142–76, including an English summary of 1½ pp.) deals mainly with parsnip and red cabbage trials and with varietal re-testing in some other crops.

4606. BRITISH HONDURAS.

Annual Report of the Department of Agriculture for the year 1958, pp. 99.

Includes various brief references to citrus, sugar cane, coconuts, bananas and plantains, cacao and vegetables.

4607. CAMBRIDGE.

Annual Report of the Plant Breeding Institute, Cambridge, 1958/59, 1960, pp. 69, bibl. 89, 5s.

Includes information on the induction of mutations in *Arabidopsis thaliana*, peas, snapdragons and other plants.

4608. CANADA.

Report of the Minister of Agriculture for Canada for the year ended March 31st, 1959, 1959, pp. 157, 50 cts.

Science Service. Spring pre-planting applications of D-D at 25 gal./acre controlled nematodes and increased tobacco yields and quality. Crop residues of timothy, corn, rye or tobacco, under certain conditions, inhibited the respiration, germination and growth of tobacco seedlings. Tobacco hornworm was effectively controlled by spraying 225 g./acre of lethal bacterial spores. Control of clubroot and root maggot in cabbage was achieved with drenches of heptachlor combined with mercuric chloride or Vancide at transplanting time. Two distinct viruses, one causing rugosity and mottle, and the other chlorotic and necrotic spots, on leaves of rhubarb were isolated. Infra-red blanching of celery for 2½ minutes reduced bacterial populations by 99.9%. Cyprex, Dichlone, Thylate and Niacide were all equally effective against apple scab and did not cause russetting. The addition of 6 lb. of sulphur to organic fungicides improved control of apple powdery mildew. *Gloeosporium* was controlled by organic mercury fungicides. Root-lesion nematodes were controlled in M.VII stoolbeds with granular Nemagon at 250 lb./acre. D'Anjou and Bartlett pear trees were found to be susceptible to *Phytophthora* collar rot. Captan and ferbam controlled brown rot of cherries. Root-lesion nematodes were found to be parasitic on peaches and to kill root tissues by secreting enzymes. Many instances of resistance to insecticides are quoted; the use of more specific fungicides and insecticides, to avoid killing beneficial insects, has been economical and successful; the effects of DDT on mites in peach orchards and of several insecticides on the apple aphid are reported. Maneb controlled leaf spot of strawberry, Cyprex controlled leaf scorch, and these 2 fungicides and captan all gave some control of strawberry fruit rot.

Annual weeds were found to harbour the root-lesion nematodes and parasitic fungi associated with strawberry root rot. *Experimental Farms Service*. Breeding tomatoes, for resistance to *Verticillium* wilt and late blight, is in progress. The place of inbreeding in the varietal improvement of apples and strawberries is also being investigated. Diphenylamine controlled apple scald, and a hydrated lime, dry-scrubber store was successfully tested. With tobacco air pollution is thought to be the cause of weather fleck, and soil temperatures were found to affect the growth of cigar and flue-cured tobacco differently; strains, resistant or tolerant to weather fleck, etch virus and black rootrot are being investigated; barnyard manure and muriate fertilizers were found to increase the Cl content of cigarette Burley tobacco.

4609. CEYLON (CHANDRARATNA, M. F.)

Administration Report of the Director of Agriculture for 1958. Part IV—Education, Science and Art (C), 1959, pp. 216 [pp. 90 in English], Rs. 5/40 plus 55 postage.

Division of botany: Brief notes on fertilizer trials with vegetables and on the mass culture of the blue-green alga, *Tolypothrix tenuis*. *Division of horticulture*: The application of 10 p.p.m. of several hormones, at 2 oz. per plant, to induce flower initiation in pineapples within 6–8 weeks; rootstocks for sweet oranges; a lime-lemon hybrid; sapodilla propagation by cuttings; yield records of guava varieties; incidence of swollen shoot disease in cacao. *Division of plant pathology*: Transmission of papaw mosaic; mottle leaf virus of chilli; control of *Fomes noxius* on a sacred Bo-tree. *Division of entomology*: *Agromyza* control on beans by seed treatment with endrin; a reduction of yellowing in chilli leaves by controlling the virus vector *Aphis gossypii*; control of *Dacus cucurbitae* by protein hydrolysate/malathion spray; control of leaf-eating caterpillars on cabbage by endrin.

4610. EAST MALLING.

Annual Report of East Malling Research Station, 1959, 1960, A43, pp. xxvi + 144, bibls, illus., 17s. 6d. or \$2.50 post free.

General review of research work (pp. 6–38): Work in progress is summarized and the results of some of the trials are briefly reported. *Research reports and reviews* (pp. 39–117): Most of the research papers have been abstracted separately. In addition, the following are of interest:— The fauna of the orchard, by V. B. Wigglesworth (being the 12th Amos Memorial Lecture). A virus-degeneration of loganberry, by J. T. Legg (a vigorous virus-tested stock is now available). Pear blister canker: a virus disease, by R. Cropley. A field study of the spread of apterous forms of the strawberry aphid, *Pentatrichopus fragaefolii* (Cock.), by G. H. L. Dicker. A note on the knock-down method for

estimating numbers of insect predators on fruit trees, by R. C. Muir and R. G. Gambrill. Damage on apple by arsenic, copper and mercury sprays: a seven year study, by A. H. M. Kirby and M. Bennett. A rapid method of measuring the magnesium content of large numbers of individual leaves, by M. Allen. *Bulletins for fruit growers* (pp. 118-140): Fruit growing in Australia and New Zealand: some impressions gained during a study tour in 1959, by W. S. Rogers. Pruning trials with dessert apples, by A. P. Preston [see also *H.A.*, 27: 3151]. The efficient fruit tree, by D. H. Maggs. Progress in research on *Verticillium* wilt and virus diseases of hops in 1959, by R. V. Harris. Progress in research on fruit crops in 1959, by B. F. Self.

4611. ENTOMOLOGICAL SOCIETY OF ONTARIO.
Annual Report of the Entomological Society of Ontario, 1958, 1959, Vol. 89, pp. 95, bibls.

For work on cutworm control in tobacco, onion maggot resistance to insecticides and host plants of the carrot rust fly, see separate abstracts.

4612. GRONINGEN.

Instituut voor Bodemvruchtbaarheid, Groningen. Verslag over 1957. (Annual Report of the Institute for Soil Fertility, Groningen, 1957), pp. 23. [English summary 2½ pp.]

This report deals mainly with soils and agricultural crops, but the following items are of horticultural interest:—Iron chelates have given good results in correcting deficiencies in flower crops. Vigour and yields of Jonathan apples on M.XVI were only satisfactory if soil samples taken in June contained at least 25 p.p.m. of nitrate N. On polder soil peas gave higher yields when artificial fertilizers were used alone than when organic manures were also applied. Root development of 28 horticultural crops was studied at different stages of growth. Asparagus roots developed mainly in the 25-60 cm. layer of soil.

4613. GRONINGEN.

Instituut voor Bodemvruchtbaarheid, Groningen. Verslag over 1958. (Annual Report of the Institute for Soil Fertility, Groningen, 1958), pp. 37, illus. [English summary 3½ pp.]

The following items of horticultural interest are briefly reported: Compared with clean cultivation, a grass mulch system in the orchard greatly depleted the soil of soluble N; early fertilization, in January, was shown to be desirable, since the uptake by the grass was lowest at that time and the N was washed down to the layers below the turf. The chelate Fe-138, applied for control of Fe deficiency in apples and pears, was not detectable in the soil 6 months after its application. It was not always possible to control Fe deficiency in fruit trees with chelates, but lime-induced chlorosis of rose seedlings disappeared within 3 weeks of applying Fe

chelates. On widely spaced french beans the placement of P fertilizer was 7 times as effective as broadcasting. Placement of P and K showed no advantage over broadcasting for lettuce and endive. The root systems of 15 bean varieties were studied in relation to root damage by mechanical cultivation. In experiments with carnations trickle irrigation with a nutrient solution of 1 atm. osmotic pressure gave the best results in one year, whereas in the second year there was no difference between watering and trickle irrigation with nutrient solutions of 0.5, 1 and 2 atm. osmotic pressure. Fertilizer requirements for vegetable crops on soils with different fertility levels are being investigated.

4614. HELSINKI AGRICULTURAL RESEARCH CENTRE.
Activity in 1958, 1959, pp. 42.

Investigations reported include work on the disease resistance of cabbage, pea, bean, cucumber and tomato varieties; control of grey mould of strawberries; diseases of ornamental plants and control of the fruit tree red spider mite.

4615. INDIAN AGRICULTURAL RESEARCH INSTITUTE,
Scientific Reports of the Indian Agricultural Research Institute for the year ending 30th June, 1957, New Delhi, 1958, pp. 136, Rs. 7 or 11s.

Division of agronomy: Optimum yields of cauliflower were obtained with 60 lb. N and 40 lb. P_2O_5 per acre. In garden pea variety trials Bonneville significantly outyielded N.P.29 and Early Badger. With sugar cane Co. 647 proved the highest cropping variety and 120 lb. per acre the optimum N dosage. *Division of botany*: The chilli Puri Red remained resistant to mosaic disease. The tomato hybrid Sioux (male-sterile) × Meeruti gave 50% higher yield than the mean of the parents. Four superior onion hybrids with light red or red bulbs have been selected for further trial. Certain Japanese varieties of watermelon had higher sugar contents than local strains, and the Japanese seedless watermelon proved satisfactory. *Division of entomology*: Bioassays showed endrin emulsion to be most toxic to castor hairy caterpillar and parathion to mustard aphid. DDT proved the most effective soil fumigant for controlling termites in sugar cane fields. *Division of mycology and plant pathology*: Among 178 sugarcane varieties tested by the plug method of infection against red rot Co. 939, 966, 1046 and B.O.30 showed resistance, but of 19 tested by nodal infection only Co. 1078 was resistant. With smut, however, 10 varieties out of 170 showed less than 5% infection. Sugar cane setts treated with Aretan (1 lb. in 10 gal. water) gave about 23% greater yields than the controls. *Division of horticulture*: Plant breeding and cytological studies; treatment of guavas with hormone sprays.

4616. I.N.É.A.C.

Rapport annuel pour l'exercice 1958. (Annual report on the work of I.N.É.A.C. for 1958.)

Publ. hors Sér. Inst. nat. Ét. agron. Congo belge, Brussels, 1959, pp. 528, bibl. 97, 160 fr. belg.

The crops and subjects discussed in this comprehensive report include: *Oil palms*: Genetical and cultural trials; seed production. *Rubber*: Selection and cultural trials. *Coffee*: Breeding and selection; cultural trials; colchicine treatment of robusta coffee; propagation by cuttings and by grafting; pest and disease control. *Cacao*: Selection; cultural trials; propagation by cuttings. *Bananas*: Cultural trials and breeding. *Botany*: Vegetative morphology of robusta coffee. *Phytopathology and agricultural entomology*: Tracheomycosis of coffee; oidium of hevea; pests of oil palms, cacao and citrus. *Genetics*: Pollen germination of oil palm; cytogenetics and floral biology of rubber; polyploidy in coffee; incompatibility in cacao; banana breeding. *Plant physiology*: Mineral nutrition of coffee; water relations. *Various economic plants*: Spices and condiments; oil seeds. Additional crops discussed in reports from regional stations include citrus, avocados, pineapples, fibre plants, tea, pyrethrum, tobacco and beans.

4617. INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES,

Report of Five Years of Activities of the Inter-American Institute of Agricultural Sciences, 1954-1959, Turrialba, Costa Rica, [1959], pp. 75 plus appendices.

Progress in research reported by the *Plant industry department* includes: *Cacao*: For control of pod rot by high volume sprays bordeaux was more effective than any other fungicide; orchard oil used as a fungicide was toxic. *Coffee*: Mulching has increased yields, probably owing to weed control; planting in close rows or hedges did not produce heavier crops than planting at the usual spacing; caturra coffee gave higher yields than the common types and its quality was also very good. Activities of the *Scientific communication service* include the provision of photocopies, short bibliographies, microfilms, reprints, periodicals and occasional publications.

4618. JERSEY.

Annual Report of the States Experimental Station, Trinity, Jersey, for 1958, 1959, pp. 96.

Investigations included an observational trial of 10 tomato varieties and a study of the amount of root rot developing in plants grown for the second year on unsteamed soil. Composting tomato haulms was a useful alternative to burning as a means of eradicating the fruit and stem rots caused by *Didymella*. Maneb and zineb sprays (3 lb./acre.) both increased the number of marketable flowers

cut from anemones. Cropping for 5 years with potatoes followed by a green crop, or for 5 years with grass, reduced eelworm populations in an infested field and resulted in higher yields from a subsequent tomato crop; treatment with D-D improved yields still more. The occurrence of many pests and diseases of tomatoes and flower crops is noted.

4619. MADRAS.

Administration Report of the Agricultural Department for the Fasli 1367 (1st July 1957 to 30th June 1958), Parts I and II, 1959, pp. 463, illus., 10 rupees 20 naye paise.

Research work is reported on the following, among other, subjects: *Entomology*: Control of *Leucinodes orbonalis* and *Heliothis armigera* on eggplant and tomato, respectively; dusting of sugar cane setts with heptachlor to control termites. *Mycology*: Studies on banana wilt (*Fusarium oxysporum* var. *cubense*); diseases of vegetables. *Agricultural engineering*: Illustrated descriptions of a mechanical bark remover for wattle and cinchona, a hand duster, a transplanter and a castor bean sheller. *Sugar cane*: Variety trials; irrigation; manuring; borer control; control of pineapple disease. *Horticulture*: Studies on vines; banana breeding and ratooning trials; apple varieties and rootstocks; plum rootstocks and dormancy breaking in plums by spraying with various chemicals; optimum age of peach seedlings for working with peach varieties; custard apple propagation and rootstocks and hybrids of *Annona* spp., passiflora varieties and pollination; selection of vegetable varieties, tomato harvesting, storage of tomato and eggplant seeds; clove propagation; nutmeg rootstocks; the use of acclimatized and imported seeds of ornamental plants; vanillin content of vanilla pods; white sapote growing; promising introductions of *Physalis ixocarpae* and of a perennial sponge gourd.

4620. MALAYA. (COLEMAN, P. G.)

Annual Report of the Department of Agriculture for the year 1958, 1959, pp. 98, illus., \$(Malay.) 2.50.

Oil palms: Progress is reported in the breeding programme to provide *tenera* progenies with standard *pisifera* parentage. Captan gave good control of *Curvularia* seedling blight. *Coconuts*: Insecticide-treated pits proved attractive breeding sites for *Oryctes rhinoceros*, but BHC was not effective in killing the grubs. Investigations are reported on 3 new or unidentified diseases. *Pineapples*: Selection and breeding; factors affecting canning quality; the cause and control of mealy bug wilt; the production of deficiency symptoms of N, P, K, Ca and Mg in sand culture. *Cacao*: Deficiency symptoms of Ca, N, Zn, Cu, B, Fe and Mo have been identified and photographed in colour. Cu deficiency caused a temporary swelling of the main stem and a shortening of the internode

length. The Quesnel fermentation method, in which beans are allowed to ferment for 48 hours at 45°C. in an alcoholic acetic acid solution, produced better chocolate than the standard micro-fermentation method. Beans dried in a rotary drier tasted more acid than sun-dried cocoa. At least 2 applications, at close intervals, of DDT, Gammalin 20, Aldrex, Dieldrex or Endrex were required to reduce infestation by *Helopeltis*. It was demonstrated that die-back is not due to a mealy bug-transmitted virus. *Tomatoes*: The effects of flooding, soil fumigation and resistant rootstocks were tested on the incidence of bacterial wilt. *Cabbages*: Diazinon gave good control of the diamond back moth (*Plutella maculipennis*). *Rambutans*: Trees grown on deep peat soils were much superior to those grown on mineral soils, making much larger heads while still being well anchored. *Durians*: When grown in orchards the lower branches are not self pruned as they would be in the natural jungle habitat, and branch breakage is common.

4621. MAURITIUS.

Annual Report of the Department of Agriculture for the year 1958, Port Louis, 1959, pp. 64, 75 cts.

Experimental work included investigations on the pests and diseases of tobacco, the diseases of tomatoes, eggplants and pelargoniums, and the pests of tea and coconuts.

4622. NATIONAL INSTITUTE OF AGRICULTURAL ENGINEERING. (THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING.) *Annual Report of the National Institute of Agricultural Engineering, 1957-58*, pp. 76 + Suppl. pp. 13, illus.

Departmental reports on current investigations include: *Agricultural testing*: Sprayers and dusters, fertilizer distributors, irrigation pumps. *Field investigation*: Pea-viner. *Glasshouse research*: Heating, ventilation, measurement of radiation, transparent plastic films for crop protection, water requirements of plants, control of the environment. *Horticultural engineering*: Irrigation (including mist control), spraying (including airstream, range and spray drift), the comparison of tillage methods for outdoor vegetables, vegetable washing and cleaning, bulb planting and harvesting, flame machines for weed control and soil hygiene in bulb growing. *Mechanical engineering*: Hop drying. *Soil*: Carrot topping.

4623. NEW SOUTH WALES.

Annual Report of the Department of Agriculture, New South Wales, for the year ended 30th June, 1958, 1959, pp. 128, illus., 10s.

Division of plant industry: Hybrid tomato lines show promise of resistance to *Fusarium* and *Verticillium* wilt. In canning variety trials Red Top and Urbana were outstanding. Three lines of a Full

Green × Brown Beauty bean cross gave better yields than the parents and were resistant to anthracnose race 2. The pea varieties Dark Seeded Perfection and Hursthouse were selected for further trials in view of their heavy cropping and canning qualities. Treatment with the hormone Duraset 40 advanced the ripening of rock melons by one week. Systox applied monthly or fortnightly increased yields of seed carrots, but germination percentages were low. Some success has been attained in the development of a blue-mould-resistant, flue-cured tobacco variety. *Division of Horticulture*: Heavy rates of superphosphates, especially as a surface dressing, have been found to improve the appearance of citrus fruits, to reduce skin thickness and acidity and to increase juice content, particularly in Valencia oranges. Diphenylamine was again effective in preventing superficial scald in apples. Blue mould spoilage of stored Winter Cole pears was greatly reduced by sodium-*o*-phenylphenate. In peach canning-variety trials Phillips was outstanding, yielding over 8½ tons per acre. Zineb with an oil spreader was again particularly effective for prune rust control, and phenyl mercuric chloride showed considerable promise. Maturity of grapes was again delayed by 2, 4, 5-T, but it was highly phytotoxic. Drenching sprays of dalapon, 2 oz./gal., almost completely eradicated Johnson grass in vineyards in November, but after heavy rains a second application in February appeared to be necessary. *Division of science services*: Only the phenyl mercuric chloride sprays suppressed the inoculum of apple black spot (*Venturia inaequalis*) on heavily infected Granny Smith foliage. Parathion at 0.05% and malathion at 5% gave good control of mealy bugs (*Pseudococcus* spp.) on sultana grapes. A three-weekly spray schedule of Gusathion gave the most effective control of a heavy infestation of codling moth (*Cydia pomonella*) and also eliminated red spider (*Tetranychus urticae*); Kelthane and Metasystox, applied in mid-January, also checked the latter for the vital 6-8 weeks before predator activity became effective. White oil and malathion were successful in a field trial against the hydrangea scale (*Pulvinaria* sp.). Both dieldrin and aldrin gave long term control of the banana beetle borer (*Cosmopolites sordidus*). It was found that a concentration of 2 p.p.m. of ethylene dibromide in the juice of citrus fruits, following dipping in an EDB emulsion, sufficed to kill all Queensland fruit fly larvae (*Dacus tyroni*).

4624. NIGERIA, EASTERN REGION.

Annual Report of the Agriculture Division 1958-59, 1960, pp. 34, 1s. 6d.

Including progress reports on rootstock and manurial trials with citrus, the use of herbicides for thinning oil palms and the effects of palm-wine tapping on oil production.

4625. NORTHERN IRELAND.

The Research and Experimental Record of the Ministry of Agriculture, Northern Ireland, 1959, Vol. 8, Pt. 2, pp. 254.

Agricultural entomology division: In long-term experiments on the control of cabbage root fly (*Erioischia brassicae*) in spring-planted cauliflowers the final yields from all the insecticide treatments were significantly higher than those from the controls, although dieldrin-dipped plants gave lower yields than those collar-dusted with BHC or aldrin and those raised in treated seed-beds and subsequently root-washed. More noteworthy, however, was the precocity of the plants from BHC-treated seed-beds which produced marketable heads considerably earlier than the others. Top growth in narcissus bulbs was almost completely inhibited following 3 hours' treatment in hot water containing an organo-mercury fungicide followed by a cold dip in dieldrin to control the narcissus flies, and formaldehyde is therefore considered to be a more suitable fungicide. The incidence of big bud in black currants was reduced from 33.6 to 10.7% by applications of 0.04% endrin and from 23 to 12.7% by 5% refined petroleum oil. *Plant pathology division*: Trials of fungicides for the control of rose diseases continued, the best results in 1958 being obtained with Fermate plus Spersul and oil-bordeaux followed by Fernide. *Horticultural centre Loughgall*: Demonstration plots of black currants have been kept weed-free for 2 years by chemical means alone with no crop injury, perennial grasses and buttercups having been eradicated by 2 applications of 7.5 lb. a.e. of dalapon plus 2 lb. of MCPA per acre and the ground subsequently kept clear with 2, 4-DES, CIPC and fenuron. Fairly good control of annual meadow grass and buttercups among raspberries was obtained with 3.75 lb. a.e. of dalapon plus 2 lb. of MCPA per acre, and a combination spray of 4 lb. of 2, 4-DES plus fenuron at 0.25 or 0.5 lb. per acre eliminated weeds and did not affect the final yield. Directed sprays of dalapon at 3.75 lb. a.e., MCPA at 2 lb., CIPC at 3 lb. and fenuron at 0.5 lb. per acre caused no injury to gooseberries, when applied in various combinations in January and May, and gave good weed control. Strawberries were tolerant of CIPC only when applied during dormancy, whereas their tolerance of a mixture of 4 lb. of 2, 4-DES plus 0.5 lb. of fenuron appeared to increase during the season. A wide range of apple varieties was unaffected by the application of dalapon at 7.5 lb. a.e. per acre, but couch grass recovered, and repeated application at lower rates is suggested. Amino-triazole at 10 lb. per acre kept the ground practically free from all weeds except horsetail. Simazine, as a directed pre-emergence spray in July, completely controlled weeds for the rest of the season among roses. Tomato plants irradiated from mercury vapour lamps for 21 days

as seedlings started cropping 4 days earlier and gave a 28.2% increase in yield in the 1st month and 10.4% more total crop. Syston Cross tomatoes proved entirely resistant to leaf mould (*Cladosporium fulvum*). The strawberry variety trial started in 1954 was terminated, and from it Cambridge Vigour emerged as the best variety. The highest yielder, Cambridge Rearguard, was of poorer quality.

4626. PENNSYLVANIA.

72nd Annual Report of the Pennsylvania Agricultural Experiment Station for the year ended June 30, 1959, being Bull. 654, 1959, pp. 30.

Staff, projects and publications listed.

4627. PLANTENZIEKTENKUNDIGE DIENST, WAGENINGEN.

Jaarboek, 1958. (Yearbook of the Plant Pathological Service, Wageningen, 1958.) Meded. PZiekt. Dienst 133, 1959, pp. 152, illus.

Diseases and pests: Most of this section consists of notes on the incidence of, and damage caused by, various diseases and pests in 1958, but the following experimental results are also reported:— The herbicide MCPB caused severe damage to peas. The best weed control in beans was with a pre-emergence application of PCP in oil at 30–40 l./ha. Mercury preparations were the best disinfectants for controlling *Fusarium oxysporum* in tulip bulbs. Very good control of black spot of roses was obtained with 0.3% zineb + 0.5% sulphur applied at 10–14-day intervals from mid-June to the beginning of September. *Studies on plant protection chemicals*: Results are briefly reported of experiments on the control of numerous pests and diseases of horticultural crops. *Special articles* concern *Uromyces croci* on crocus, and a leaf spot of apple caused by *Mycosphaerella pinodes*.

4628. QUEBEC.

Rapport du Ministre de l'Agriculture de la Province de Québec pour l'année finissant le 31 mars 1959. (Report of the Minister of Agriculture of the Province of Quebec for the year ending 31st March 1959), 1959, pp. 299.

Includes brief reports, abstracted separately, on apple fruit colour and storage, fungicide trials with tomatoes and gladioli, and weed control in vegetables.

4629. QUEENSLAND.

Annual Report of the Queensland Department of Agriculture and Stock for 1958–59, 1959, pp. 106, illus.

Items of horticultural interest include: *Agriculture branch*: Weed control in onions by a pre-emergence application of CMU at 1 lb./acre. *Horticulture branch*: Larger pineapple planting material flowered

and fruited earlier. No satisfactory alternative was found to sodium arsenite as a selective weed killer in banana plantations. Some stunted or chlorotic bananas showed spectacular responses to foliar or soil applications of Mg. Apple storage investigations included the use and mode of action of diphenylamine in controlling superficial scald on Granny Smith, controlled atmosphere storage, and measurements of the size and number of cells in apple tissue by new methods. Strawberries responded to superphosphate, and plastic mulch gave higher yields than tan bark mulch. The proportion of stringless ginger in the rhizome was almost 50% at flowering time, subsequently decreasing at a determined rate. Mg deficiency in cauliflowers was shown to be of major importance in parts of north Queensland. Crops in variety selection trials included papaws, citrus, avocados, macadamia nuts, custard apples, strawberries, tomatoes, carrots and lettuce. *Plant pathology section*: Tobacco leaves sprayed with a zineb-cotton seed oil-methyl salicylate mixture to control blue mould broke down on curing. The immersion of ginger rhizomes in a mercurial fungicide (6% Hg) at 2 lb./40 gal. for 10 minutes controlled fusarium rhizome rot. Fortnightly or weekly sprays of captan over the month prior to harvest reduced the incidence of *Sclerotinia* brown rots in stone fruits. A species of *Gloeosporium* isolated from strawberry flowers was shown to kill the flowers or, in lesser infections, to prevent fertilization. Studies on the control of banana leaf spot (*Cercospora musae*) with oil sprays were continued.

4630. SAANICHTON.

Summary Report Experimental Farm Research Branch, Saanichton, B.C., for 1958, 1959, pp. 18, being Publ. 173.

Research briefly described includes: *Vegetable crops*: New varieties of pea and early cabbage; vernalization of hard heading lettuce; chemical control of clubroot in cabbage and cauliflower. *Ornamental crops*: The effects of precooling on daffodils; forcing of heat-cured iris bulbs; chrysanthemum culture; propagation and nutrition of holly. *Tree and small fruits*: Propagation and productivity of apples on Malling IX rootstocks; culture of grapes, peaches, strawberries and loganberries. *Weed control* in bulbs, strawberries and loganberries. *Mulch*: The effects of sawdust mulches. *Agronomic crops*: Lawn renovation. *Machine and equipment development*: New plant growth chambers, holly packaging machines, herbicide plot sprayer.

4631. SCOTTISH HORTICULTURAL RESEARCH INSTITUTE.

Sixth Annual Report, 1958-59, Mylnefield, 1959, pp. 74.

Reports of the various departments include work on the following: *Pomology*: Breeding, cultivation

and weed control of raspberries; breeding of black currants; variety trials of strawberries and red currants; top fruit varieties and rootstocks. *Vegetable culture*: Breeding of brussels sprouts, cabbages and french beans; variety trials of these, also broad beans, peas, broccoli, calabresse, spinach, parsley, carrots, beetroot, leeks and winter lettuce. *Crop physiology*: The physiology of growth of the strawberry plant. *Genetics*: Spring chlorosis of strawberry; production of polyploids; *Ribes* crosses; and the cytology of *Brassica oleracea*. *Virology*: Soil-borne and aphid-borne viruses of soft fruits and potatoes. *Mycology*: Grey moulds and other diseases of soft fruits and tomatoes. Longer articles include accounts of variety trials of broad beans and parsley and a review of research on *Brassica oleracea*.

4632. SURINAM.

Jaarverslag Landbouwproefstation, Suriname, 1958. (Annual Report of the Surinam Agricultural Research Station for 1958), 1959, pp. 90.

Includes work on citrus, bananas, cacao, coffee and coconuts.

4633. TANGANYIKA.

Tanganyika Agricultural Corporation Report and Accounts for 1957-58, Dar es Salaam, 1959, pp. 149, illus., 16s.

Cashew: Trials on *Helopeltis* control using 1% BHC dust. *Castor*: The optimum planting date for the variety Giant was March 3rd and for Hernon Feb. 8th. *Tobacco*: In NPK experiments laid down on new and second-year land, N responses were noted early, followed by P. Potash deficiency was seen in the second-year plots that received no K.

4634. TRINIDAD AND TOBAGO.

Administration Report of the Agriculture Department for the year 1957, 1959, pp. 49, 60c. (T'dad).

Work briefly reported includes: *Sugar cane*: Variety trials; yield figures. *Cacao*: Clonal trials; breeding for witches' broom resistance; artificial drying by electricity; black pod and witches' broom control by low-volume cuprous oxide formulations. *Citrus*: Rootstock trials; the reduction of fruit drop in oranges by hormone sprays; control of epiphytes on grapefruit trees and of pests and diseases. *Bananas*: *Cosmopolites sordidus* control by dipping suckers in aldrin; reduction in moko disease (*Pseudomonas solanacearum*) by improved drainage; leaf spot control; potash deficiency. *Mangoes*: A simplification of grafting by the T method. *Pine-apples*: Acceleration of flowering by 10 p.p.m. NAA. *Pests and diseases* of tomatoes.

4635. TYSSER, H. F. (EDITOR).

The Fruit Annual 1960.

British-Continental Trade Press Ltd., 222, Strand, London, pp. 569, £1.

Compiled on similar lines to previous issues [see *H.A.*, 29: 2014] this publication provides a comprehensive reference book for all sections of the industry. The World Directory lists over 5,000 firms concerned with the distribution of fresh and processed fruit and nuts and the manufacture of equipment for growing and handling produce. A list is also given of journals of interest to the fruit trade from 16 countries.

4636. U.S. DEPARTMENT OF AGRICULTURE.

Food, being *Yearbook of Agriculture 1959*, Supt. Documents, Washington, D.C., 1959, 9 × 6 in., pp. 736, \$2.25.

Contains 66 articles covering many aspects of food but little of direct horticultural interest.

4637. U.S. DEPARTMENT OF AGRICULTURE.

Report of the Secretary of Agriculture, 1958, Washington, D.C., 1959, pp. 81, 30 cents.

On progress, achievements, marketing and general developments in U.S. agriculture.

New periodical.

4638. JUGLAS, J.-J., AND OTHERS (EDITORS).

Fertilité [*Fertilité*], English Edition, 1957, No. 1, to 1959, No. 7, 10½ × 8 in., No. 1, pp. 24, illus., 15 Rue du Louvre, Paris 1^{er}, 1000 fr. (France), 1200 fr. (elsewhere) per annum, or 300 and 400 fr. per number.

The cover of this new quarterly journal states that it provides 'information on tropical and subtropical fertilization', and its contents are concerned with investigations on the soils and on nutritional needs of the crops of these regions. Some of the articles so far published are in the nature of reviews, but the bias is mainly experimental, and, as would be expected in a journal coming from France, it has already presented several useful articles on the foliar diagnosis approach to nutritional problems. It is apparently produced in four languages and as the authors are from a number of countries the journal has a broad, almost international character. It is well printed and illustrated and the pages are perforated so that individual articles can, if desired, be neatly removed.